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GRANULOSA CELL TUMORS OF THE OVARY*

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THE granulosa cell tumor of the ovary is a comparatively rare tumor, but one which presents a number of features of the greatest interest, because the variety of its histologic appearances may make its recognition difficult. Likewise, it is of very great interest from the physiologic and clinical viewpoint, because there is definite evidence to show that this tumor elaborates the ovarian hormone, and upon this fact depend many of its clinical manifestations. Finally, from the standpoint of prognosis, it is a comparatively benign tumor and its recognition justifies simple extirpation when it occurs in young women. Since the historical aspect has been so well reviewed by Te Linde, and others, we shall omit discussion of this phase of the subject.

The frequency of this tumor is impossible to estimate accurately, because the earlier classification was in such confusion, and because a number of the more interesting cases have appeared several times in the literature in discussions by various authorities. The largest single series is that observed in the laboratory of Robert Meyer, who reported 33 cases in 1931. Many of these, however, came to him from outside sources. Plate states that there have been about 150 cases, but does not enumerate.

We have found four cases among 43 ovarian carcinomas occurring in 7500 gynecologic cases over a period of nineteen years and two

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other specimens have been brought to the laboratory from outside sources. Four of these were originally diagnosed as medullary carcinoma by competent pathologists. That the error is not an uncommon one is indicated by the fact that the microscopic illustrations of "medullary carcinoma" or "solid carcinoma" in almost any of the standard texts discussing gynecologic pathology may be taken as fairly typical examples usually of the cylindroid type of the granulosa cell tumor. The pathologic diagnosis, however, is not a particularly difficult one if one considers carefully the criteria established by Robert Meyer, although in some cases one must study sections from several areas.

These tumors are usually unilateral and the majority are comparatively small in size, varying from the almost microscopic ones discovered accidentally to about the size of a man's head. Rarely they attain larger size, as in the case of Dworzak, which weighed 3.5 kilograms, and the very exceptional case of Te Linde which measured 30 cm. in diameter and weighed 9.2 kilograms. Occasionally they are associated with fibromas, papillary cysts, or teratomas.

The tumors, as a general rule, are very well encapsulated with a thick, fibrous capsule. On cut section, there appear macroscopic cysts the size of a pea, rarely up to the size of a hen's egg, containing fluid. In some this is described as clear and straw colored, in others as greenish and turbid. The greater part of the tumor is usually solid, moderately firm, sometimes very friable. Some show considerable vascularity. The tumors with predominantly folliculoid structure are striking even macroscopically. In the firm connective tissue, there are numerous friable submiliary to pea-sized areas of which particularly the larger ones stand out because of their completely circular outline.

The microscopic structure is exceedingly varied and has been described most exhaustively by Robert Meyer. In certain of his tumors, he has found these varied pictures all present in different areas of one and the same growth, with transition forms between them, and has thus been able to prove the genetic relationship between seemingly very dissimilar forms. He describes three main types, the folliculoid, the cylindromatoid, and the diffuse or sarcomatoid. The most easily recognizable type and the one in which the morphologic resemblance to the normal granulosa cell is most striking is the folliculoid. It is also the rarest. The cells are small, very uniform in size and shape, and very similar to the granulosa cell of the normal follicle. They have a tendency to form structures somewhat resembling a normal follicle, although Meyer cannot agree with v. Kahlden about the extremely great similarity to normal follicles, even in v. Kahlden's own case. Ova are never found, but the tumor cells have a peculiar

tendency to arrange themselves regularly about drops of secretion or degenerating cells and become cut off into follicle-like spherical structures. Some of these groups form cysts of various sizes, of which several may run together in irregular form. The follicle-like structures may be grouped together to form large, almost entirely epithelial masses, with very little stroma, which may show much hyaline degeneration, or they may be widely separated by large masses of connective tissue. In certain cases, there is a tendency for the connective tissue to form a sort of theca about the follicular structures, although Meyer attaches less importance to this than does v. Werdt.

The cylindromatoid tumors are far more common but are much more difficult to recognize. They are frequently diagnosed as "medullary carcinoma" or "solid carcinoma" or even as endothelioma or sarcoma. In these, the small folliculoid structures are almost entirely absent or appear only in a rudimentary form. There may be large undifferentiated epithelial cell masses in which vacuoles may be entirely lacking and the connective tissue shows no hyaline degeneration but remains relatively rich in cells. In other cases, the cell masses may be broken up into small alveoli and the greater the breaking up, the more irregular is the form and arrangement of the cells. Most characteristic of this type, however, is the finding often of very complicated patterns of epithelial strands resembling *moiré* silk. Thin cords of one or more layers of epithelial cells interlace in parallel or branching strands, curves, and whorls to form sometimes extremely bizarre but very characteristic patterns.

In a few cases, there may be a diffuse picture resembling a sarcoma. The epithelial cells lose their epithelial character and become rather hard to differentiate from the stroma cells which may show a sarcomatoid proliferation. Recently, Meyer has come to believe that many cases considered as ovarian sarcoma actually belong in this group and this view is also subscribed to by Kermauner. This may explain the formerly puzzling cases in which precocity and other manifestations of endocrine influence were ascribed to tumors of connective tissue origin. One case of Meyer's is interesting in this connection in which a recurrence following a granulosa cell tumor appeared almost entirely as a spindle cell sarcoma; only in very scattered areas was it still possible to recognize the epithelial character of certain cells.

The histogenesis of these tumors is not absolutely established, although there is a general tendency to agree with Meyer that they probably arise from unused rests of granulosa cells in the medullary portion of the ovary, and particularly from misplaced rests in various types of congenital anomaly.

The other pelvic organs show changes which are to be ascribed to the hormonal influence of the tumor, and these naturally are most striking when the tumors appear in postmenstrual life when the ova-

rian hormonal influences have ordinarily ceased. In the children, data concerning the state of the uterus, and particularly of the endometrium, are usually lacking but since all showed vaginal bleeding, it is probable that hyperplasia of the endometrium may have been present.

Pahl states that, in his case in a nine-year-old child, the uterus was not enlarged or congested in spite of marked sexual precocity. In old women, the large size of the uterus, that of a woman in active sexual life, was striking, and, in some cases, myomas of considerable size which ordinarily atrophy with the menopause were found. Meyer found an endometrial hyperplasia of the glandular-cystic type which is ascribed to excess of the follicular hormone in all of his cases in which the endometrium was available for study (19 of 33). Klaften found evidence of functional activity of the glands in a number of postmenopausal women by demonstrating glycogen in the cells, and also demonstrated lutein-like changes in the tumor cells by special staining methods. That lutein hormone may be produced by some of the tumors is also suggested by the development of an actual decidua in the uterus in rare cases, as that of Arnold, Körner and Mathias in a sixty-three-year-old woman, and that of Dworzak in a patient fifty-two years old. In certain cases, as those of Taussig, Te Linde, and R. Schröder, a carcinoma of the endometrium had developed, possibly on the basis of a preexisting hyperplasia. Adenomyoma of the uterus, and, more rarely, other pelvic endometriosis has been reported fairly frequently, and has been ascribed to hormonal influences from the tumor by Tietze, King, Klaften, and others. The tubes usually showed the microscopic picture of those of young women. The ovary of the opposite side was usually normal; in old women senile, in young women showing normal follicle development; although sometimes the normal processes were apparently inhibited by the hormonal influence of the growth. That no permanent damage was done is shown by the numerous histories in which a normal menstrual cycle was resumed almost immediately following the removal of the diseased ovary. The tumors were bilateral in 6.2 per cent of 80 cases collected by Klaften. When they were bilateral, both ovaries were usually considerably enlarged, an important point in the consideration of treatment. Apparently independent growths of the opposite ovary are occasionally recorded, as cystomas, dermoids, and endometriomas.

The clinical features of these tumors are quite as interesting as the pathologic ones, and aside from the mere mechanical results of their presence, are dependent very largely upon their endocrine influence. There is very definite evidence that the tumor elaborates the ovarian follicular hormone. The results of this ovarian activity are naturally most striking when the tumor occurs at an age when ovarian activity is ordinarily in abeyance, as before puberty or after the menopause.

The tumor may apparently occur at any age, but is relatively rare before puberty, and relatively common in old age. Of 80 cases which Klaften collected, 7, or 8.7 per cent, occurred before or in the beginning of puberty; and 34, or 42.5 per cent, after the menopause. Two cases occurred at five years, and 8 were between 70 and 80.

The children showed evidence of sexual precocity; development of the breasts, of axillary and pubic hair, and vaginal bleeding. In one of Meyer's cases, there was an actual secretion of colostrum. Pahl's

nine-year-old child had the size, appearance, and demeanor of an adolescent. In Rummeld's case, a five-year-old child showed bleeding and swelling of the breasts.

In old women, there is often a sort of rejuvenation with a feeling of renewed youth, as well as swelling of the breasts, occasional galactorrhea and vaginal bleeding, sometimes periodic, more often irregular. The uterus in these women attains the size of that of a woman in active sexual life and the endometrium shows hyperplastic changes. In one woman who had ceased menstruating only two years previously and who still suffered from extreme vasomotor symptoms, these disappeared with the development of the tumor. One of our own patients developed very distressing vasomotor symptoms after the removal of her tumor.

During active sexual life, the symptoms are naturally more difficult to evaluate. However, the presence of severe and long continued hemorrhages which do not yield to ordinary endocrine treatment should arouse suspicion, especially if an ovarian enlargement can be palpated, although sometimes severe symptoms may occur with extremely small tumors. One of Klaften's cases showed this picture, and Tietze's case had been curetted for bleeding almost yearly from the age of eighteen to thirty-three, and had had an Alexander suspension and cervical amputation without result. The endometrium always showed a marked hyperplasia. She finally refused further curettage and demanded active intervention, and a granulosa cell tumor of her left ovary, as well as an adenomyoma of the uterus was discovered at operation. In other cases, there may be an amenorrhea, or periods of amenorrhea alternating with profuse and prolonged bleeding. In certain cases, the presence of amenorrhea with a unilateral adnexal mass may bring up the differential diagnosis of ectopic pregnancy, as in one of our own cases, and occasionally the presence of breast changes may strengthen such a suspicion. It is probable that sterility may be dependent upon endocrine influences from the tumor. One of our patients had been sterile for five years but had a child without further treatment within two years after removal of the tumor.

Symptoms due to the actual presence of the tumor itself may occur at any age. Pain is a frequent symptom, and pressure symptoms may occur. Abdominal enlargement is relatively infrequent, since the tumors are usually small, but may be due to ascites, which is sometimes present. Torsion of the pedicle is not very frequent, but may give rise to acute symptoms as in one of our cases.

The patients are sometimes anemic, due to hemorrhage, but as a rule their general condition is good. Sedimentation time has been recorded only in recently reported cases, but varied from two to three and a half hours in four cases of Klaften. In three of our own cases, it varied from one to three hours.

Studies of these cases from the endocrine standpoint are just beginning to appear in the literature. Klaften found a basal metabolism of 18-plus and 24-plus respectively in two of his cases which returned to normal after the removal of the tumor. Schuschania's studies, although they were made upon one case only, are most significant. A woman of sixty-seven years, who had had the menopause at fifty-eight, had bled vaginally for two weeks. She had an enlarged uterus with a hyperplastic endometrium and a fist-sized granulosa cell tumor of the right ovary. Quantitative tests showed that she excreted large amounts of follicular hormone in both urine and stool preoperatively and for a few days after operation and that her Frank test was positive. Sixty-six days after operation no hormone could be demonstrated in either urine or stool. It seems extremely probable that the tests for follicular hormone will assume as great diagnostic and prognostic importance for granulosa cell tumor as does the Aschheim-Zondek reaction for hydatidiform mole and chorionepithelioma.

Implantation experiments were negative in Schuschania's case. Similar negative results with implantation experiments have been reported by Meyer, Kermauner, and Kaufmann, although Polano was able to demonstrate enlargement of the uterus of a mouse with the content of a "myxosarcoma" from a one-and-one-half-year-old child with precocious menstruation.

As might be expected the Aschheim-Zondek test is of little value in these cases, although occasionally a positive Reaction I has been reported. We performed the Aschheim-Zondek reaction on the eighteenth and twenty-third postoperative days, respectively, in two of our postmenopausal cases with negative results throughout.

The prognosis in these tumors is a matter of great interest. That they are relatively benign, there is no doubt, as is shown by the considerable number of cures following simple excision of the tumor. The long duration of symptoms and the large size they occasionally attain without extension beyond the capsule, as in Te Linde's 20-pound tumor which had given symptoms for four years, also speaks for benignity as well as the fact that spilling cyst contents during operation is not necessarily disastrous. Yet to arrive at an accurate estimate of the percentage of five-year cures is practically impossible, since unfortunately a large proportion of the cases have been described soon after the operation by pathologists, and there is no record of what happened to the patient. Further, the confusion in the earlier literature makes it impossible to be certain which cases one should actually include in the group.

Of Meyer's series of 33 cases, one woman died postoperatively and only three from later metastases. As far as he could ascertain, 19 had remained permanently cured after operation, most of them for more than one year, others for more than four years. In Te Linde's compilation of 33 cases, only 17 of which were followed,

13 of the cases were reported as well from one to eleven years after operation. Only four of the series had been followed until death; of these, one was an immediate postoperative death, and three had died within six months after operation with definite recurrences. Lepper, Baker and Vaux have recently reported 7 cases, of which 6 have remained well for from four to fifteen years after operation, and one for eleven months.

Klaften was able to collect 80 cases which gave enough clinical data to form a prognostic estimate. These included the 33 cases of Robert Meyer, 10 of his own, 6 of Neumann and smaller series of various authors. He found that in 5, or 6.2 per cent, the tumors were bilateral. When they were bilateral, both tumors were usually large. In 4 cases, or 5 per cent, there were recurrences or metastases. In 6 cases, or 7.5 per cent, the tumors were described as inoperable. This is in considerable contrast to the less than 10 per cent curability of ovarian carcinoma in general.

Even recurrences have not the absolutely hopeless prognosis usually associated with them, as is indicated by the ten-year cure of Rummeld's child after her second operation. This five-year-old girl had bilateral tumors, but as part of one ovary looked normal, this ovary was resected instead of performing a radical operation in view of her extreme youth. Her symptoms disappeared but three years later recurred, and it was found that a tumor had developed in the remaining portion of the ovary. This was removed and she had remained well without further symptoms ten years later.

The question of the radiosensitivity of these tumors is important for the cases in which complete removal is not possible and for old women who are poor operative risks. They should be amenable in view of the marked sensitiveness of normal granulosa cells to radiation, as has been pointed out by Schiffmann, Dworzak and Habbe, but as yet there are no clinical observations of sufficiently long standing to be of value. Dworzak's fifty-two-year-old patient who had a 3½ kg. tumor was entirely well one and three-quarters years after removal of the tube and ovary only followed by a course of x-ray therapy, yet a similar result has often been obtained without radiation. One of our own patients is well one year after complete removal of her pelvic organs, plus a course of x-ray treatments, far too soon to come to any definite conclusions. The same criticism applies to Habbe's case of a seventy-three-year-old woman whose tumor could not be completely removed. It disappeared under x-ray treatment and the uterus decreased to the normal senile size. In Schiffmann's second case, however, in which postoperative x-ray treatment followed an incomplete removal, the tumor continued to grow rapidly.

A review of our own cases follows.

CASE 1.—E. S. G., aged fifty-four, complained of vaginal hemorrhages for two years, spotting for one year and blood-streaked stools. Her mother, living at eighty, had had her menopause at fifty-five, and had been cured of "cancer of the hand" at seventy. Patient has had five children and two miscarriages. Her menses began at fifteen and were irregular at the onset. Since then they occurred every twenty-eight to thirty days and lasted five days, with a moderate flow until her

present illness. Four years previous to admission, the periods became more profuse and gradually more prolonged with large clots until they lasted two weeks and weakened her greatly. For two years the regularity of her periods was maintained, then she had a six months' period of amenorrhea, and since then, the hemorrhages had been irregular and less severe with spotting between them. She had had a dragging sensation in the pelvis and pressure on the bladder and rectum. For a few weeks the stools had been blood streaked.

Her physical examination was negative, except for her pelvic findings and the presence of hemorrhoids. The outlet was relaxed, the cervix large with patulous os, the uterus enlarged and retroverted, the adnexa not palpable. Blood count within normal limits, sedimentation time two hours plus. Urine negative. A panhysterectomy and bilateral salpingo-oophorectomy were performed on Oct. 26, 1931. Her postoperative course was uneventful except for an unexplained low grade fever for twenty-three days. On the twenty-third postoperative day, an Aschheim-Zondek

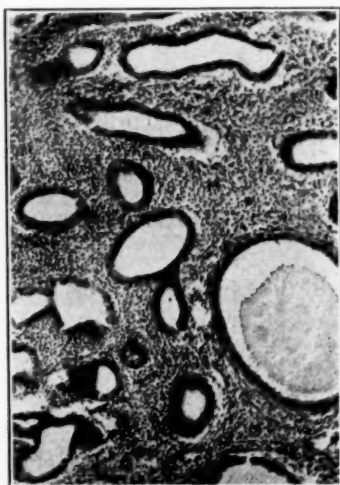


Fig. 1.—Hyperplastic endometrium of Case 1.

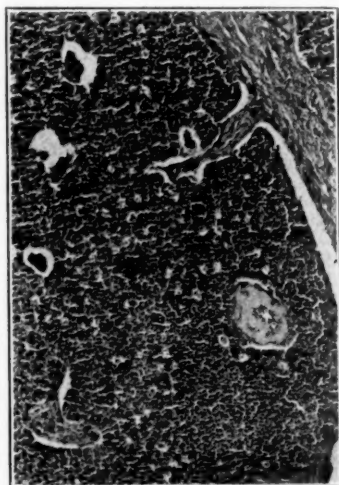


Fig. 2.—Folliculoid type of growth in Case 1. Note encapsulation.

reaction on the urine was negative. An x-ray of the skull showed the sella well outlined and of normal size. Her pelvic examination on discharge was negative and she has remained well for a year, her only complaint being due to extremely severe menopausal symptoms which showed some improvement under endocrine therapy.

The pathologic examination gave the following findings: The uterus was enlarged to the size of a two and a half months' pregnancy and had a thick fibrous wall. There was a marked glandular cystic hyperplasia of the endometrium (Fig. 1) with a large mucous polyp. The cervix was markedly hypertrophied. The tubes were normal with no evidence of senile change. The ovaries were small, wrinkled, grossly atrophic organs of a yellowish white color. There was no evidence of activity on superficial examination. On section, the left ovary contained a few small white bodies and one larger collection of circumscribed cellular areas in one large capsule measuring 1.5 cm. in diameter and occupying one pole of the ovary. This tissue was slightly yellow in color, appeared highly cellular and was traversed by many fibrous septa so that it appeared lobulated. On microscopic examination, the right ovary showed only a fibrous stroma with a few corpora albicantia. The left ovary showed

a very cellular picture. Practically the entire section was composed of circumscribed nodular collections of cells which were separated by fibrous trabeculae and which bore much resemblance to normal granulosa cells (Fig. 2). They showed a remarkable uniformity in size, shape, and staining qualities, were small and rounded with comparatively large nuclei. There were occasional mitoses (Fig. 3). There was a considerable tendency for the cells to group themselves radially about small cystic spaces containing cellular debris, thus giving rise to structures somewhat resembling primordial follicles, with occasional larger cysts lined by several layers of the granulosa-like cells. There was very little connective tissue stroma, but a considerable number of twisted hyaline strands which resembled corpora albicantia.

CASE 2.—E. T., aged fifty-four, had had a long and eventful gynecologic history. She first entered the University of California Hospital in April, 1921, aged forty-three, complaining of irregular menses. Her family history was negative. She had had practically all the exanthemas. She had had a hemorrhoidectomy at the age of thirty-seven and a cervical polyp had been removed at the age of forty-one. She had had three children with easy normal labors and one early spontaneous miscarriage. Her menses began at twelve years and were irregular, occurring about every six

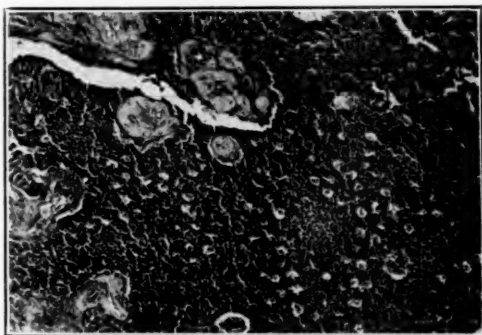


Fig. 3.—Folliculoid type, Case 1. Note hyaline bodies resembling corpora albicantia.

weeks, lasting three to four days, and were scanty. For five years they were more frequent and more profuse until the polyp had been removed. Since then they had been normal until the past two months when she had flowed profusely for two to three weeks. For several years, she had had an ache or dull pain in the left lower quadrant, worse during her periods, and had also had frequent fainting spells. She was under a physician's care for her heart.

Her physical examination at this time was negative except for a systolic apical murmur and the pelvic findings. She was slightly anemic. The cervix was large, the uterus was enlarged, hard, retroverted, and movable. The left ovary was the size of an English walnut. She was curetted and 596 mc. hours of radium were given in the uterine cavity. The endometrium was thickened but no polyps were found.

The second entry was in June, 1927. Following the radium six years previously her periods had been normal until December 26 when she missed her regular period. She started to flow on January 21 and had flowed moderately but continuously since. One week before admission she had bled so profusely that packing was necessary. Her examination was practically the same as on previous entry, except that she had a mild hypertension, blood pressure 160/90. The sedimentation time was three hours.

The uterus was large, the sound entering $3\frac{1}{4}$ inches, the cervix was hard and corrugated with nabothian follicles and a small polyp. There was considerable descent. She was curetted, the cervix was resected and 1214 mc. hours of radium were inserted. The pathologic examination showed a chronic endocervicitis with nabothian follicle cysts, a benign cervical polyp and hyperplasia of the endometrium.

The third admission was on Dec. 21, 1931. She had been fairly well since the last operation. Her periods were very irregular, she often missed months completely; for almost a year she had daily slight spotting. Her examination was practically the same as on the previous admission. On December 23, a dilatation and curettage, posterior colporrhaphy, supravaginal hysterectomy and bilateral salpingo-oophorectomy were performed.

Her postoperative course was uneventful. An Aschheim-Zondek reaction on January 11 was negative. She has been very well for eleven months but has had some menopausal symptoms.

Pathologic examination gave the following findings: The uterus was the size of that of a woman in active menstrual life. The endometrium was markedly hyperplastic. The tubes were normal, showing no evidence of senile changes. The left

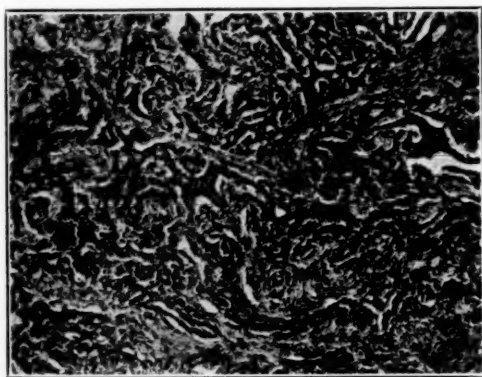


Fig. 4.—Cylindromatoid picture in Case 2. Note moiré silk pattern of epithelial strands.

ovary showed only a dense fibrous stroma containing a few corpora albicantia. There was no evidence of activity. The right ovary measured 4 by $1\frac{1}{2}$ by $1\frac{1}{2}$ cm., was swollen in its central portion and had a shiny yellowish surface. On section, there was a thick white capsule while the swollen central area was filled with a sharply demarcated yellowish growth with a hemorrhagic center, which, on casual inspection, might easily have been considered a corpus luteum. Sections showed also a dense fibrous stroma. The growth was very cellular, the cells showed much resemblance to normal granulosa cells. In some areas, there was a slight tendency to grouping about very small cystic spaces, giving somewhat the picture of a primordial follicle, but most of the section showed the bizarre moiré silk pattern of the cylindromatoid type of growth (Fig. 4).

The long gynecologic history is of interest in this case and, in view of the slight ovarian enlargement on her first admission, it is interesting to speculate whether this small tumor may not have been present over many years, yet have been inhibited in its manifestations by the radiation therapy.

CASE 3.—A. P. C., a widow of forty-seven, complained of abdominal pain and vaginal bleeding. Her family history was positive for carcinoma on both sides of the family and for tuberculosis on the maternal side. Her past history was irrelevant.

She had had one child, a normal pregnancy and labor, no miscarriages. Her menses began at fifteen and were regular, lasting 4 to 5 days. Bleeding was profuse with clots but no pain. For a time, she bled ten days of every twenty-one, then resumed the former rhythm. At the age of thirty-eight her menses ceased abruptly at the death of her child. At 43½ she again began to flow, rather irregularly but periodically, the periods lasting about four days and being very profuse. One year previously and again shortly before admission she had bled continuously for a month. She had had lumbar backache for several years and a sense of bladder pressure for some months. One month prior to entry, she had an attack of severe cramping lower abdominal pain with nausea, vomiting, and weakness, and was in bed for two weeks with occasional chills, vomiting, and fever. A physician had diagnosed uterine fibroids.

Physical examination showed a small, thin woman with a moderate anemia, a mitral heart disease with stenosis and insufficiency, a mild hypertension, an umbilical hernia, and a large firm pelvic tumor. Her sedimentation time was one hour.



Fig. 5.—Cylindromatoid area from Case 3.

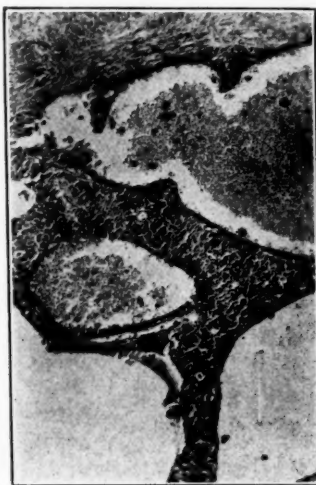


Fig. 6.—Folliculoid area from Case 3.

At operation on Nov. 19, 1931, a panhysterectomy and bilateral salpingo-oophorectomy were performed, removing a large left ovarian tumor with twisted pedicle.

Her postoperative course was uneventful except that because of the pathologic diagnosis of medullary carcinoma, she was given a course of x-ray treatments which caused considerable reaction. She remained well until a year later.

Pathologic examination showed a considerably enlarged uterus, about the size of a two months' pregnancy, with a small subserous myoma. There was a hyperplastic polypoid endometrium. The tubes were those of a young woman. The right ovary was senile. The left ovary formed a large, flat, ovoid mass measuring 13 by 10 by 5 cm. and weighing 400 gm. The surface was smooth and shiny, and through it several small yellow areas and cystic follicles could be seen. On cut section the tumor was, in general, firm, white and fibrous in appearance. There were a number of yellow areas somewhat suggesting corpora lutea, and a few cysts filled with a dark gelatinous content. The tissue seemed well vascularized.

Microscopic section showed a rather varying picture. The stroma was quite firm and fibrous in some areas, in others edematous and even myxomatoid. This stroma

was invaded in masses, strands and singly, by tumor cells which were small and of somewhat varying shape. In the larger masses, they bore considerable resemblance to granulosa cells, with occasionally a moiré pattern (Fig. 5). Most of the cystic spaces were rather irregular, but the cells lining them also resembled granulosa cells, and occasionally showed a radial arrangement about very small cystic spaces (Fig. 6). In other areas, there was a very diffuse, sarcomatoid pattern (Fig. 7). There were many mitoses. A diagnosis of medullary carcinoma was made, but later review of the case and careful study of many sections convinced us that it is really a granulosa cell tumor. The clinical history and the large uterus with hyperplastic endometrium are confirmatory.

It is interesting that this patient, since her operation a year ago, has undergone a change in personality so striking that it is the subject of much comment among her nonmedical associates. She was formerly shy, almost asocial, rarely speaking to any one, and has suddenly become gay, friendly and very social in her tendencies. One should really expect the opposite change.

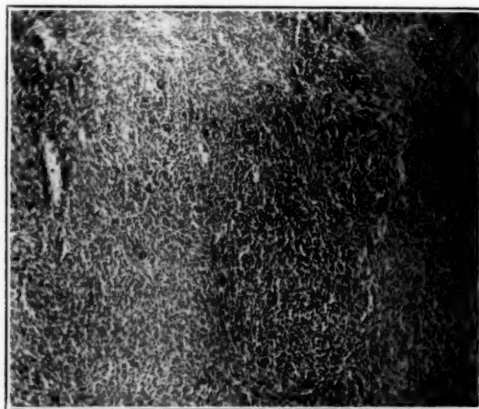


Fig. 5.—Cylindromatoid area from Case 3.

CASE 4.—A. S., aged twenty-seven, complained of right-sided pelvic pain. Family history negative. Past history irrelevant. Menses began at thirteen, were regular, and very profuse until two years before admission. At this time, she had a fall and was "paralyzed" for several days. Since then, her periods were very irregular and scanty, every one to two months, lasting one day. The last period was three months previously. She had been married five years and had had no children, although she desired them. An excellent gynecologist consulted six months previously because of the sterility had told her the pelvis was perfectly normal. For four months she had had rheumatic pains all over her body which had been very severe for two weeks. In the course of a general examination, it was found that she had a left-sided adnexal mass. In view of her amenorrhea, the question of ectopic pregnancy came up although an ovarian cyst was considered more likely. A few hours after the examination, she had much pain in the side and a slight soreness had persisted for a week.

Examination showed an obese young woman with normal hair distribution. Her general physical examination was negative except for infected tonsils and a tooth abscess which showed on x-ray examination. Her pelvic examination was negative except for the left-sided adnexal mass.

On Jan. 29, 1918, a dilatation, curettage, a left salpingo-oophorectomy, appendectomy and tonsillectomy were performed. The uterus was infantile in type, measuring $2\frac{3}{4}$ inches by sound, and there was practically no endometrium present. The left ovary was 5 cm. in diameter and contained a large blood cyst which was at first considered a corpus luteum cyst. During the operation, the cyst ruptured on one surface and the contents started to extrude, and it was found that in addition to the blood clot, there was some tissue which seemed to resemble infarcted placenta and it was thought that we might be dealing with an ovarian pregnancy. On microscopic examination, however, it was found that the tumor content consisted of an almost entirely epithelial mass of small, regular, remarkably uniform cells with practically no supporting stroma, although it contained a considerable number of quite large blood vessels (Fig. 8). There was a tendency to hyaline degeneration in the stroma which was present. There was a considerable number of mitoses, and a diagnosis of medullary carcinoma was made.

However, in view of the patient's youth and great desire for offspring, it was decided to do nothing further, but keep her under extremely close observation. Her



Fig. 8.

Fig. 8.—Solid masses of small granulosa cell-like cells from Case 4.



Fig. 9.

Fig. 9.—Broad bands of granulosa-like cells with some tendency to folliculoid arrangement. Case 5.

convalescence was uneventful. She has remained entirely well for fifteen years and has had one child, a boy, born about two years after the operation. She has become even more obese since this time but there is probably a large dietary factor.

Later review of her tissue allows us to classify it as a granulosa cell tumor, as the cells resemble normal granulosa cells very markedly. In areas, there is a very typical moiré silk picture, and further sections have even shown a very slight tendency to folliculoid structure in certain areas. Why this patient did not exhibit the characteristic uterine enlargement remains a question, and unfortunately, her endometrium did not reach the laboratory.

In Case 5, specimen of which was sent to the laboratory for diagnosis from an outside source eleven years ago, clinical data are unfortunately lacking, except that she died of recurrence about four years postoperatively.

The tumor consisted of a large cystic mass, which had been opened and had collapsed, but had apparently measured about 15 cm. in diameter. The outer surface was smooth, the wall varied from 2 to 4 cm. in thickness and presented

an extremely irregular inner surface. On cut section, it seemed extremely cellular and friable, and was intermingled with much hemorrhage. The uterus was two times normal size with a hyperplastic endometrium, the tubes normal, the opposite ovary small and inactive. Sections of the tumor showed broad bands of epithelial cells separated by connective tissue stroma (Fig. 9). The cells were small, very uniform in size, shape and staining quality, with comparatively large nuclei, and showed a tendency to arrange themselves perpendicularly to the connective tissue. In certain areas, they surrounded cystic spaces forming structures resembling follicle cysts. There were many mitoses and the original diagnosis was that of a rapidly growing medullary carcinoma. Later review of the material makes it seem certain that we are dealing with a granulosa cell tumor.

Case 6 was a very small tumor measuring only about 2 cm. in diameter which was brought to the laboratory by an outside pathologist who was puzzled by its appearance. Clinical data are incomplete but it was considered an incidental finding in an operation for fibromyomas in a postmenopausal woman who had begun to bleed periodically and had not responded to x-ray therapy. It is probable that the ovarian tumor was of far greater importance in this clinical picture than its small size would indicate, for it was a typical granulosa cell tumor, with a largely cylindromatoid structure, but showing a folliculoid arrangement in smaller cell groups about the edge of the main epithelial mass. This is a recent case also, and its outcome will have to be reported later.

We realize fully that all except two of our cases are open to the same criticism that we have made of so many in the literature, that they are reported too soon to know the final outcome. However, the subject seems of such great interest at the present time that we present them in spite of this objection, and hope to report their ultimate prognosis at some future date.

CONCLUSIONS

Granulosa cell tumors of the ovary are not so rare as was formerly supposed.

They are frequently mistaken for medullary carcinoma, or even for sarcoma or endothelioma by those not familiar with their characteristics. The pathologic diagnosis is not, however, particularly difficult if these characteristics are kept in mind.

There are three main histologic types, the folliculoid, the cylindromatoid, and the sarcomatoid. Frequently, two or all three of these types are found in different areas of the same growth.

The clinical diagnosis may be easy before puberty, or after the menopause, but is difficult during active sexual life. A careful study of the patient from the endocrine standpoint will prove of great aid in the preoperative diagnosis of these cases, as well as in postoperative prognosis. There is definite evidence that these tumors elaborate the ovarian follicular hormone, and possibly, in some cases, the lutein hormone also. It is probable that the follicular hormone tests will become as important for these cases as is the Aschheim-Zondek for chorionepithelioma.

These tumors are usually unilateral and comparatively benign, and simple excision of the tumor is ordinarily curative. It is, therefore, most important to make a preoperative or at least an operative diagnosis, as this allows of conservatism in the case of young women. In women past the menopause, complete removal of the pelvic organs is preferable if the patient is a good risk. In the rare cases where complete removal of the tumor is not possible, postoperative radiotherapy will probably increase the chances for cure.

NOTE: Since presenting this paper, there has been one further case in the University of California gynecologic service which may be included in this category. This was a nine-pound, right-sided, multilocular cyst containing large solid areas, occurring in a fifty-one-year-old woman whose menses, regular until forty-five, had since been very irregular and prolonged with occasional intermenstrual spotting. At forty-six years of age, a cyst had been resected from the right ovary. The remainder of the ovary and the left one were considered normal. The nature of this cyst is unknown.

Pathologic examination showed an enlarged uterus with a hyperplastic endometrium. The ovarian tumor showed many areas of typical cylindromatoid structure, and other sarcomatoid areas, but a folliculoid arrangement was almost entirely absent. The opposite ovary was normal. The uterus, both tubes, and ovaries were removed, and a course of deep x-ray therapy was given. A Frank test one month postoperative was negative. She is well two months later.

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THE PROBLEM OF IRREGULAR MENSTRUATION*

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THE occurrence of menstrual irregularities has long been held an important symptom in the study of gynecologic disease. This conception was based on the assumption that the menses occur at regularly stated intervals in the great majority of individuals, and that any deviation from this standard is evidence of a pathologic condition. There is, however, good reason to doubt the traditional belief that menstruation does occur regularly, and from this standpoint it is necessary to inquire further into the circumstances under which irregularities are of significance as a symptom of disease.

The standard textbooks demonstrate a very general agreement on this fundamental question. It is stated that approximately 70 per cent of all patients have regular menstruation of twenty-eight or thirty days' duration, and that the balance present either shortened or lengthened cycles. It is also claimed that patients may be grouped into specific categories according to the length of the intervals, such as twenty-eight-day types, twenty-one-day types, thirty-day types, while it has been advanced that the total length of cycles in days is usually some multiple of seven, such as 28, 14, 35, etc. A recent textbook of obstetrics even makes the statement that not only do the majority of women menstruate every twenty-eight days, but during the time of the new moon.

These assertions are invariably based on statistical studies made of the statements of patients, the majority of whom undoubtedly make no effort to keep accurate records of their menstrual periods. From the standpoint of scientific accuracy these histories are of no value, and unfortunately there have been but few attempts to study the question by means of carefully planned records. Three such studies have been reported, one by Foster¹ in 1889, one by King² in 1926, and one by Geist³ in 1930, and in each case it was clearly demonstrated that menstrual cycles not only in different individuals but in the same individual, vary tremendously in their duration. It would seem, however, that traditional beliefs and lunar superstitions have had a stronger hold on the profession than these valuable scientific contributions.

The problem is one of such fundamental importance that an extensive investigation to determine the length of successive menstrual

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cycles in a group of healthy young women was recently conducted with the assistance of Dr. Ethel D. Owen and the cooperation of the Stanford School of Nursing (Fluhmann⁴). A large group of nurses were given small calendars on which the dates of their menses were recorded, and from this the cycles were estimated as periods extending from the first day of a menstrual flow to the next. Every precaution was taken to eliminate any possible pathologic state or abnormal condition due to life in an institution, and finally 76 records were accepted as the basis for this analysis. Each individual was observed for periods varying from six to thirteen months, and a total of 747 cycles was available for study.

An analysis of the 747 cycles shows very clearly the great variability in their length. The range is from 11 to over 144 days, although 97 per cent of instances were grouped between eighteen and forty-two days. The most frequent cycle was of twenty-nine days with 73 cases, while the mean was of 30.4 days.

A study of the individual cases is still more impressive as regards the great variability in the lengths of successive cycles. No instance of absolute regularity was noted. However, by giving a very loose interpretation to the term "regular" and considering as such the cases where all but one or two cycles fell within a five-day period, 28, or one-third, could be placed in this category. Of these, only 9 had cycles which fell within twenty-six to thirty days, while in 6 there was a tendency for the cycles to be shorter, and in 13 to be of longer duration.

In 48, or two-thirds, of the cases the cycles were very irregular. Although in 16 the menses were considered as of the "irregular delayed" type, it is noteworthy that only 4 fell in the "irregular too frequent" group. On the other hand, the largest group of the series, 28 cases, showed a tremendous variability in the lengths of the cycles, some at times being very short (for example, eleven days) and others very long (for example, seventy-eight days).

However revolutionary these results may seem to be, they are in keeping both with those of Foster and of King, and likewise with those of a third unpublished study conducted in Baltimore, Md., by Dr. Josephine Ball (Hartman⁵). It would seem that our future interpretation of menstrual irregularities must be approached with the conception that such irregularities are more frequent in normal individuals than so-called regular cycles.

POLYMENORRHEA

The least frequent type of menstrual cycle noted in the Stanford investigation was that of shortened duration, since there were only 6 (7.8 per cent) in the "regular too frequent" and 4 (5.2 per cent) in the "irregular too frequent" group. This is of interest not only because this irregularity is of considerable importance as a symptom of disease, but also because these figures correspond closely to a number of other statistics on normal menstruation which were based on patients' statements. It seems quite logical that a woman

who menstruates at intervals of two or three weeks would much more readily have her attention directed to this phenomenon than one in whom the periods are further apart.

In a previous communication (Fluhmann⁶) the mechanism by which polymenorrhea as an abnormal condition may be brought about, was discussed. It was pointed out, in the first place, that the patients may have a hyperplasia of the endometrium, a condition characterized by a failure of ovulation with consequent lack of corpus luteum formation and an excessive production of the ovarian follicular hormone ("hyperestrinism"). In 8 out of 75 patients with this condition cyclical bleeding was noted at intervals shorter than four weeks (Fluhmann⁷). The second possibility, which was advanced by Schroeder,⁸ is that the menstrual cycle is shortened because of an injury or inherent weakness of the ovary so that there is a premature disintegration of the corpus luteum with a resultant early appearance of menstruation. This is apparently the explanation for the occurrence of too frequent menses in patients with pelvic inflammatory disease (Fluhmann⁹). The third possibility is based on the assumption that there is a speeding up of all the events of the menstrual cycle, and it was intimated that this may be due to a primary overactivity of the anterior hypophysis. A fourth theoretical possibility may be advanced although it represents an unusual condition, namely, that some women may have a slight flow at the time of ovulation such as occurs in certain animals. There thus appears frequent cyclical bleeding but only every second period can be considered as true menstruation.

In an analysis of abnormal uterine hemorrhage in 507 gynecologic patients (Fluhmann and Morse¹⁰) it was observed that this bleeding was cyclical and occurred at intervals shorter than four weeks in 59 cases. In all but 9 of these, an organic lesion such as pelvic inflammatory disease, fibromyoma uteri, or hyperplasia of the endometrium, was present, and in 34 of the 59 profuse periods were complained of in addition to the frequency of occurrence. It has seemed important, therefore, to review these histories and analyze this symptom in more detail. It was then found that in only 8 instances had the menses been too frequent since their onset at puberty and no recent change had been observed. In 4 cases the menses had always been frequent, but some additional abnormality, such as a more profuse flow or shortening of the cycle, had supervened, while in 5 cases this information could not be obtained from the history. On the other hand, the shortening of the cycle in 42 of the 59 cases was a symptom which had appeared secondarily a few months or years before the patient reported for treatment.

It would seem, therefore, that polymenorrhea must still be considered as an important symptom directing attention to pelvic disease. It is, however, of the utmost consequence to remember that it only has

full significance when it appears as a change from a previous rhythm or when it is accompanied by an increase in the amount of blood loss. The occurrence of menses at more frequent intervals than four weeks, especially when persisting from the time of puberty, may be an essentially normal phenomenon, and when unassociated with demonstrable pelvic disease or harmful blood loss, is not per se an indication for treatment.

DELAYED MENSES

The significance of irregular delayed menses becomes still more difficult to interpret when the fact that two-thirds of normal women have prolonged cycles is taken into consideration. This symptom has been held an important indication of diminished ovarian activity and as a prominent factor in sterility, but it would seem that considerable doubt must be attached to statistics which are advanced to prove this contention since accurate figures for control series were not employed.

The occurrence of irregular delayed menses is not incompatible with normal health, and the majority of these women not only have large families but do not necessarily develop more serious conditions subsequently. A review of the last 15 cases of irregular delayed menses in married women reporting for investigation shows that 9 had always had long menstrual cycles and of these 7 had borne full-term children. The two who had never become pregnant were young women of twenty-two and twenty-three respectively, so that they could hardly as yet be considered sterile. An analysis of the histories of 18 women with prolonged periods of amenorrhea, which must be considered as a serious complication, presents some interesting information on the relation of irregular delayed menses to this condition. In 10 of the patients there had always been irregular delayed menses, in 7 they had been considered as regular, while in one they were stated as being at first regular and later irregular. There is such a slight difference in the two groups, and in the normal series irregular delayed menses occurred so much more frequently than so-called regular, that one is inclined to believe that the existence of irregular delayed menses alone is not an important precursor of cessation of ovarian function.

On the other hand, the occurrence of irregular delayed menses is undoubtedly associated with other features which indicate an abnormal condition. One of the most frequent concomitant symptoms is that of scanty flow, and it would seem that this is a very important feature. In the Stanford series, 823 menstrual periods were analyzed and it was found that under normal conditions the average duration of the hemorrhage is 4.6 days, while in the vast majority of instances it varies from three to seven days. It also seemed definite that the length of the menstrual cycle in normal individuals has no influence on the duration of the flow which remains a much more constant fac-

tor. The occurrence of any marked change in the length of the menstrual periods or in the amount of blood loss is apparently a more significant finding indicating an abnormal condition than any irregularity in the length of the cycles.

Among other important findings which may be associated with irregular delayed menses in addition to scantiness of the flow, are obesity, hypertrichosis, vasomotor disturbances and diminished basal metabolic rate. It cannot be denied that these patients form an important endocrinologic group which is sorely in need of careful investigation and the development of adequate treatment. The finding of irregular delayed menses in such patients, however, may not be as significant as it has been maintained, since all the associated symptoms mentioned above may be present in women who claim that their periods occur regularly every month. It would seem that a progressive condition where the cycles become successively longer and the flow gradually less, is a much more significant sign than the mere fact that the patient's menses have been irregularly delayed since puberty.

SUMMARY

Recent investigation suggests that the length of successive menstrual cycles in normal women is characterized by a marked irregularity in at least two-thirds of instances.

The occurrence of irregular menstrual cycles in the absence of demonstrable pelvic disease should not be considered as an abnormal finding requiring treatment, unless (1) it represents a change from a previously established rhythm, (2) it is accompanied by a marked increase or decrease in blood loss, or (3) it is associated with concomitant symptoms pointing to an endocrinologic disturbance.

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AN ANALYSIS OF 575 CASES OF ECLAMPTIC AND PRE-ECLAMPTIC TOXEMIAS TREATED BY INTRAVENOUS INJECTIONS OF MAGNESIUM SULPHATE*

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TO BE orthodox, one should start a paper on the treatment of the eclamptic toxemias with the statement, that until the cause of eclampsia is discovered, a satisfactory treatment is not possible. This statement, or a similar one, is made by nearly all the writers on this subject, but I find myself unable to subscribe to this stand.

Before discussing treatment, it might not be amiss to consider the etiology; not with the idea of adding a new theory as to the etiology of this "disease of theories" but rather to explain clinical results in preventing the occurrence of this clinical syndrome in properly supervised pregnancies.

Clinically, the eclamptic toxemias may be divided into, (1) the true, or hepatic toxemias, (2) the nephritic toxemias, and (3) the nephritic toxemias with a superimposed true eclamptic factor.

The eclamptic attack in a chronic nephritic is readily explained. The kidneys, which are just maintaining the balance of health in the nonpregnant condition, are unequal to the additional burden placed on them by the pregnancy, and a greater or lesser degree of kidney insufficiency results in the toxemic attack. This type of eclampsia tends to recur earlier in each succeeding pregnancy.

When we consider the etiology of the true or hepatic type, we are confronted with such an abundance of theories as to give this syndrome the name of the "disease of theories." At first, we had the pathologic era, in which the cause was sought in the changes found at autopsy, then the bacteriologic era, when the cause was sought in a specific microorganism; local foci of infection, dietary indiscretions, absorption of fetal or placental products, the breasts, all have been indicted as the possible elusive cause of eclampsia; and now, in this endocrine era, it is no more than should be expected, that endocrine dysfunction should be accused. Anselmino, Hoffman and Kennedy¹ make a case against the posterior lobe of the hypophysis, accusing its hyperfunction of being a causative factor in eclampsia. And yet, with all the earnest study and investigations of laboratory workers and clinicians, we find the statement made year after year that we are no nearer a solution of the problem.

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I believe this to be due to the fact that there is no single specific cause of the eclamptic syndrome, in other words, that while it may be a clinical entity, it has not a specific etiology.

To me, the eclamptic syndrome is a complex toxemia, originating in the pregnant condition, which successively involves liver and kidneys, thus adding to the original toxemia, the toxemia of liver and kidney insufficiency.

Whatever the original toxemia is, I believe it to be comparatively mild, requiring some activating cause to bring about the eclamptic attack.

Among such possible activating causes are dietary indiscretions, local foci of infection, acute infectious processes and as secondary foci, placental infections.

With this conception of the etiology of the eclamptic attack can be explained the success of proper prenatal care in reducing the incidence of eclampsia, and it also explains the failure to obtain a specific cure.

In a former paper,² I discussed in detail this conception of the etiology. When we consider the treatment, we find as much confusion as to the proper treatment as there has been in the attempt to find the cause of the eclamptic attack.

Treatment advocated may be divided into two classes, viz.: active surgical interference and conservative medical treatment, with a possible third class, the "mittleren linie therapie" of the Germans, the middle line therapy.

Surgical attack has, for the most part been directed against the pregnancy, viz., induction; accouchement forcé, or cesarean section. Surgery has not been limited to this, however, as there have been such radical and bizarre procedures as surgical cranial decompression, total hysterectomy, ablation of the breasts and kidney decapsulation advocated and practiced. These latter procedures, have, fortunately, never become popular. The preponderance of opinion in this country is definitely in favor of conservative medical treatment, rather than subjecting these very poor operative risks to the additional burden of a surgical procedure.

The medical treatment as advocated in different clinics is also varied and some of the methods are antagonistic to each other.

Some years ago,³ the forcing of water, to the extent of tubing the patients every four hours and pouring water into them, 1 to 1½ liters at a time, was advocated and in August of this year, Arnold and Fay⁴ in a valuable article lay the greatest stress on dehydration, balancing the liquid intake against the output.

The Stroganoff treatment of sedation with morphine and chloral and noninterference with the pregnancy is so well known, that I need

only mention it. It forms the basis of most of the conservative treatment of today.

I wish to devote this paper to a consideration of the intravenous magnesium sulphate treatment as developed at the Los Angeles General Hospital in the past eight and one-half years. This is essentially a sedative, dehydration therapy.

At the outset, it would be well to consider what we expect to accomplish by treatment. If we are convinced that the eclamptic syndrome is the result of a complex toxemia and that there is no single specific etiologic factor, then we must give up the hope of ever obtaining a specific cure. Treatment must be directed against the results of the toxemia, symptomatic or empiric treatment, if you please, rather than at the ultimate cause.

The problem may be divided into three parts, first and most important, the proper supervision of the pregnant woman. Hygienic and dietary regulation, the elimination, as far as possible, of all local foci of infection, and protection against acute infections, will in the great majority of pregnancies prevent the occurrence of a toxemia; second, the treatment of preeclamptic toxemias, whether of the nephritic type or the so-called true or hepatic type; and third, the treatment of the eclamptic attack itself.

It is the intravenous magnesium sulphate treatment of the last two classes, preeclamptic toxemias and eclampsias that I wish to discuss.

In the preeclamptics, the objectives of treatment should be, first, to antidote as far as possible the effects of the toxemia; second, to help the crippled emunctories by proper regulation of diet; third, to stimulate the elimination of toxins; fourth, to eliminate as far as possible all exciting causes; and fifth, to terminate the pregnancy as conservatively as possible *before the onset of convulsions*, if the results of treatment are not satisfactory.

In the eclamptic, our first objective should be the control of the convulsions and coma, in order to minimize the danger of fatal accidents, such as cerebral hemorrhage, acute cardiac decompensation, pulmonary edema, or aspiration pneumonia occurring during the convulsion or coma; second, in the antepartal case, to conserve the pregnancy, if possible, until the active eclampsia is overcome, and in the intrapartal case, to terminate the labor as conservatively as possible, in order to minimize the additional burden put on the patient; and third, to help elimination and endeavor to combat the results of the toxemia.

These results, I believe, can be best accomplished by magnesium sulphate, which we prefer to give intravenously, aided by intravenous injections of glucose.

Since our first report,⁵ in 1925, there have been reports from various other clinics, many favorable, others not so favorable.

M. P. Rucker,⁶ in discussing the late sequelae of eclampsia reports the results in three series of his cases. He said, "Group 1, 38 cases with 12 deaths (31.5 per cent), occurred in the period when our chief idea in the treatment consisted of immediate delivery either by accouchement forcé or cesarean section; Group 2, 58 cases with 15 deaths (25.8 per cent), came at a more conservative period when reliance was placed upon morphine, chloral, and bromides with repeated stomach washings and colonic irrigations; Group 3, 110 cases with 6 deaths (5.45 per cent), begins with the advent of magnesium sulphate for the control of the convulsions. Little else was done to these patients except to give a massive dose of digitalis and plenty of water by mouth."

J. R. McCord,⁷ reports a mortality of 3 per cent in 100 cases, treated by an initial dose of morphine sulphate gr. $\frac{1}{4}$ or $\frac{1}{2}$, 20 c.c. of 10 per cent magnesium sulphate intravenously hourly and glucose intravenously every eight hours.

DeLee in commenting on this in the 1931 *Year Book* says, "Some lucky fortune must have attended him in attaining such an enviously low maternal mortality, 3 per cent in 100 cases." It would seem that there must have been something more than "some lucky fortune"; possibly the treatment may have had something to do with it.

Adverse comment is not wanting, beginning with Stander's⁸ criticism based on animal experimentation. At first, Stander considered the intravenous use of magnesium sulphate unsafe and unwarranted, but after further animal experimentation, conceded that in doses of 20 c.c. of 10 per cent solution it was safe. He, however, limited the amount to 60 c.c. in twenty-four hours for the average sized woman: an amount which in our experience would be wholly inadequate for the severe eclamptics. DeLee in the fifth edition of his textbook, says, "In the United States, in the conservative treatment of eclampsia, it bids fair to supplant Stroganoff's as first choice," only to say in the 1931 *Year Book*, that he has lost faith in magnesium sulphate and has returned to morphine sulphate to control the convulsions, without, however, giving any reasons.

Arnold and Fay⁹ make the statement that magnesium sulphate intravenously "is not eliminated through the kidneys, does produce renal inflammation and for the most part is excreted into the large bowel"; and, in their opinion, "several cases of ulcerative colitis may have been precipitated or augmented by the use of this drug, intravenously."⁴

In many thousand injections, we have never seen the slightest effect on the bowels; nor any damage to the kidneys that could be attributed to its use.

Lissner¹⁰ in a paper on the intravenous use of magnesium sulphate in hypertension and allied eye conditions, read before the American College of Physicians in 1932, states that "the intravenous administration of magnesium sulphate does not have any influence on the bowels." He bases the statement on an experience of seven and one-half years and several thousand injections.

Our present report includes 371 preeclamptic cases of both the nephritic and the two eclamptic types, of which 21 developed convulsions (5.6 per cent), and of 225 convulsive toxemias, a total of 575 cases. They are from the services of the author and Dr. L. G. McNeile at the Los Angeles General Hospital.

Preeclamptics.—These cases fall into two groups: first, those admitted in labor and found to have a systolic pressure of 150 or over, usually, with albuminuria and to whom magnesium sulphate is given as a prophylactic, and second, those admitted during the last two

weeks of their pregnancies as frankly toxic cases and in whom the intravenous injection is the main feature of the treatment.

Table I shows the results as to group, the occurrence of convulsions and mortality in our two series of cases, the first series included in my report of 1929¹² and the second from July, 1929, to November, 1932.

Maternal mortality of the preeclamptics: Besides the one patient who died after developing convulsions in the first series, there were three deaths of patients who did not develop convulsions, one, a nephritic who had had an early termination of a previous pregnancy, had an induction and died of a surgical shock after her delivery; the second one had an advanced syphilitic hepatitis at autopsy; and the third one had suppurative endocarditis and pulmonary infarcts at autopsy; a gross mortality of 2.8 per cent in the first series of preeclamptics. In the second series of 228 cases, two patients died, 0.8 per cent. One developed a fulminating eclampsia and is included in the mortality of the eclamptics and the second one did not have convulsions, developed an abruptio placentae and was sectioned, a total of 1.6 per cent gross mortality for the 371 patients who came under treatment as preeclamptics.

TABLE I. PREECLAMPTICS TREATED WITH INTRAVENOUS MAGNESIUM SULPHATE

	CASES	GROUP 1	CON- VULSIONS	GROUP 2	CON- VULSIONS	MORTAL- ITY PER CENT
		Prophy- lactic				
To July, 1929	143	55	5	88	6	2.8
July, 1929, to Nov., 1932	228	78	1	150	9	0.8
Total	371	133	6	238	15	1.6

Table II shows the nature of the deliveries in the preeclamptics and eclamptic cases.

As to the babies: Of the 350 patients who did not develop eclamptic convulsions, there were 12 pairs of twins delivered, 270 living babies discharged from the hospital, 14 babies died after delivery, 58 were stillborn macerated fetuses and 20 patients were discharged improved and undelivered.

Eclampsics.—In former reports,^{2, 11, 12} the first 125 cases treated by intravenous magnesium sulphate were analyzed and discussed. These cases dated from May, 1924, to July, 1929. From July, 1929, to November 1, 1932, there have been an additional 100 cases.

Mortality.—In evaluating any method of treatment, the mortality rate is usually taken as an index of the value of the treatment. As for example, Irving is quoted by DeLee¹³ as having abandoned the intravenous use of magnesium sulphate because of 13 patients to whom he administered it, 38.4 per cent died while of 98 to whom he did not give it, 25.9 per cent died; the apparent conclusion being that the

magnesium sulphate was in some manner responsible for the greater mortality. Without a critical analysis of the fatalities, I believe any conclusion might be fallacious, especially in a small series of cases. We, for example, have had as many as 32 consecutive cases without any mortality, only to have four deaths in the next seven cases.

I would like to emphasize that our eclamptic cases are, in the great majority, patients who have been unsupervised during pregnancy and most of them coming under treatment after the onset of convulsions, some as long as twenty-four to forty-eight hours after the first convulsion. Only 21 of the 225 eclamptic cases came under treatment before the onset of convulsions. Table III shows our gross and corrected mortalities in the three series of cases comprising this report.

TABLE II. DELIVERIES IN 150 PREECLAMPTICS

SPONTANEOUS	FORCEPS	VERSION	INDUCTION	ABDOMINAL SECTION	VAGINAL SECTION	HYSTERECTOMY	UNDELIVERED
89	9	1	28	19	2	2	10
DELIVERIES IN 86 ECLAMPTIC CASES							
		VERSION BREECH					
38	19	4	2	18	1	1	3

TABLE III. MORTALITY TABLE OF ECLAMPTICS TREATED WITH INTRAVENOUS MAGNESIUM SULPHATE AT THE LOS ANGELES GENERAL HOSPITAL

	CASES	GROSS MORTALITY	CORRECTED
May, 1924, to February, 1926	54	16 $\frac{2}{3}$ %	11.5%
February, 1926, to July, 1929	71	7.0 %	5.7%
July, 1929, to November, 1932	100	16.0 %	10.5%
	225	13.33%	9.5%

If we consider only the mortality percentage, a jump in the rate from 7 per cent in the second series to 16 per cent in the third, might be discouraging and indicate that some modification of the treatment might be responsible for the increase. As a matter of fact in the second group of 71 cases there was little else done than the intravenous magnesium sulphate, while in the last group of one hundred cases, more intravenous glucose was used. We are not abandoning that part of the treatment, however, as a critical analysis of these fatalities will I believe satisfactorily explain the reason.

Of the 16 patients who died, 13 had had convulsions before admission varying in time from one to fourteen hours and in number from 1 to 14 convulsions.

As to the delivery, one was a postpartum eclampsia; one died undelivered, there was one spontaneous delivery, one postmortem section, one accouchement forcé and version, one accouchement forcé and forceps, two bag inductions and forceps, one bag induction and Kristeller

expression, one breech extraction, three cesarean sections, one vaginal hysterotomy, and two forceps extractions.

Three of these patients died within six hours of admission and are excluded in the corrected mortality, three had abruptio requiring operative delivery, three were found at autopsy to be nephritic cases without any liver changes suggestive of eclampsia, and are excluded in the corrected mortality; four had cerebral hemorrhages of greater or lesser extent. One death was probably due to an acute alcoholism, one patient died of the trauma of operative delivery after the eclampsia had been practically overcome, definitely an "error of art."

In evaluating the mortality rate, in addition to the six cases which were excluded, three because they were moribund when they first came under treatment and three because they were straight nephritics (proved at autopsy) and died of uremia after the convulsions were controlled, one patient died as a direct result of operative trauma, one was carried too long as a preeclamptic, and one was in all probability an alcoholic poisoning. If these three deaths which should not be charged as failures against the treatment were also excluded in the corrected mortality, we would have seven deaths in 91 cases for a corrected mortality of 7.8 per cent.

As to the babies in 86 antepartal and intrapartal eclamptics in the last group of 100 cases, there were 3 pairs of twins, 55 living babies discharged from the hospital, 5 premature babies died after delivery, 28 were stillborn babies and one mother died undelivered.

Intercurrent Eclampsia.—In our first series of cases, we had 28 per cent of so-called intercurrent eclampsias, i.e., those recovering from the eclampsia and going from several days to several weeks without recurrence of eclampsia. In our second series, of 37 antepartum eclampsias, there were 35 per cent which became intercurrent. In the present series, there were 82 antepartal cases, of which 19 (23 per cent) went from two days to two months from the control of the convulsions until the termination of pregnancy without further convulsions. Of these, 13 went into labor and delivered spontaneously, one had a forceps delivery, three had sections and two were discharged undelivered and were delivered at home, three weeks and two months, respectively after discharge from hospital.

The most interesting of these intercurrent eclampsias was the patient who went two months after the control of the eclampsia to a spontaneous labor, being delivered of a full-term healthy baby. This patient, a gravida i, was admitted January 6, 1931, from the Pasadena Hospital where she had been admitted twenty-four hours before; she had had five convulsions before admission to the Pasadena Hospital where she was placed on a Stroganoff régime. Her convulsions were controlled until 8:30 A.M., January 6, 1931, when she was transferred to the Los Angeles General Hospital. During the twenty-four hours she was in the former hospital she had received 3 gr. of morphine sulphate and 60 gr. of chloral. On admission to the Los Angeles General Hospital she was in a convulsion. She was placed on intra-

venous magnesium sulphate and intravenous glucose. She had convulsions at varying intervals until thirty hours after her admission, having seven convulsions; during this time, she had eight injections of magnesium sulphate (160 c.c.) and two intravenous injections of 50 c.c. of 50 per cent glucose and morphine sulphate gr. $\frac{1}{4}$. Treatment was continued and no further convulsions occurred. She was discharged, undelivered, on January 29, 1931. Blood pressure was 110/70. She placed herself under the care of Dr. Skelton of Pasadena, who reported that she was spontaneously delivered of a full-term living child on March 1, 1931, fifty-four days after onset of eclampsia, having had no further eclamptic symptoms after leaving the hospital.

During her stay of three weeks at the Los Angeles General Hospital, she received a total of 27 intravenous magnesium sulphate injections (540 c.c.). In seeking an explanation of this recovery from a clinically severe type of eclampsia (13 convulsions during sixty hours), with an uninterrupted pregnancy, we sought for the probable etiologic factor in this particular case. We found that a few days before the onset of eclampsia the patient had had an abscessed tooth extracted. I believe that the absorption of toxins from the infected abraded tooth socket precipitated the eclamptic attack and by the time it was controlled, further absorption was stopped by the healing of the tooth socket and as fortunately in this case there was no secondary involvement of the placenta, the pregnancy continued as a normal one.

Cesarean Section.—I have for many years followed the conservative treatment of eclampsia as opposed to the radical surgical treatment of these highly toxic patients, as I believe that eclampsia per se is a contraindication to operative attack. In the presence, however, of active labor and cephalopelvic disproportion, or other urgent obstetric indication, such as abruptio placentae, section must be done notwithstanding the poor operative risk, also in the preeclamptic or the eclamptic, who has recovered from the convulsive attack, and who is not responding satisfactorily to treatment, I believe section is at times indicated as an aid to the treatment of the toxemia.

In our first two series in which there were 100 ante- and intrapartal cases, section was done six times, in the third series of 100 cases in which there were 86 ante- and intrapartal cases, there was one post-mortem section, one vaginal hysterotomy, one hysterotomy and sterilization in an eight weeks' pregnancy and 15 abdominal sections.

The indications for the abdominal sections were abruptio placentae in 4 cases, a previous section for toxemia, in one case; mechanical dystocia in 2 cases and persistent toxemia in 8 cases, in one of which convulsions recurred two days after they were controlled. In only three of these cases was the operation done during the eclamptic attack, the others being done from thirteen hours to thirteen days after the control of the eclampsia. In two of the patients operated upon during the attack, the indication was cephalopelvic dystocia and in one case, continuation of the toxemia with recurrent convulsions (after forty-eight hours) was the indication.

There were three deaths among those sectioned, one an abruptio placentae, sectioned under spinal, forty-eight hours after control of

convulsions; one chronic nephritic, sectioned sixty hours after the eclamptic convulsions were controlled but while the patient was comatose, the coma continuing until death, in uremia five days after operation; and one died twenty-eight hours after operation, and had subpial hemorrhages at autopsy.

Our present routine is as follows:

Preeclamptic Cases.—

1. Usual sedative and eliminative treatment and dietary regulation.
2. Blood pressure 150 systolic, or higher; 20 c.c. $MgSO_4$ 10 per cent solution intravenously; blood pressure to be taken twice daily and the intravenous magnesium sulphate repeated if blood pressure does not come down.
3. Surgical interruption of pregnancy only to be done with the consent of senior attending obstetrician.

Eclampsia.—

1. Twenty cubic centimeters of 10 per cent solution $MgSO_4$ intravenously as soon after first convulsion as possible.
2. Repeat injection of $MgSO_4$ every hour until convulsions are controlled (attending obstetrician to be notified if convulsions are not controlled within three hours).
3. Blood pressure to be taken every hour after convulsions are controlled and if it begins to rise, again nearing its height at time of convulsion, repeat $MgSO_4$; also repeat if convulsions recur.
4. Intravenous glucose, either 1000 c.c. of 10 per cent solution for patients with little edema or 50 c.c. of 50 per cent solution in those with marked edema, as indicated for scanty urinary output and for patients with low CO_2 combining power, especially if delivery or operation is to be done.
5. If patient is comatose, or very restless in a semicomatose delirium and blood pressure is falling, give chloral gr. xx and NaBr lx per rectum.
6. All patients to be prepared for delivery as soon as they are quiet enough to do so.
7. Utmost quiet to be observed and nurse to be constantly with patient until coma has cleared.
8. Oxygen inhalations after each convulsion until breathing is normal.
9. If patient is in labor, nitrous oxide for pains.
10. If in second stage labor and proper progress is not being made, low forceps extraction or version may be done with consent of attending obstetrician.
11. *Cesarean section only to be done for absolute obstetric indications and with consent of senior attending obstetrician.*

Variations from the above routine only to be made on direction of the attending obstetrician.

CONCLUSIONS

1. In view of the varied etiologic factors which may produce the eclamptic syndrome, it is in all probability impossible ever to obtain a specific cure for eclampsia.

2. The objectives of treatment in the preeclamptic should be (a) to overcome the effects of the toxemia by sedation and elimination; (b) to remove as much work as possible from the embarrassed emunctories by proper regulation of diet, with particular reference to the balancing of the fluid intake with the output; (c) to terminate pregnancy as

conservatively as possible, where there is not proper response to treatment, *before the onset of convulsions*.

3. The chief objective of treatment of the eclamptic should be the control of the convulsions and the protection of the patient against accidents during the convulsions and coma; surgical termination of the pregnancy during the eclamptic attack is only justified in patients in labor, presenting some urgent obstetric indication.

4. In our experience, the sedation and elimination necessary, is best secured by intravenous magnesium sulphate in sufficient dosage, aided by intravenous injections of glucose.

5. A series of 225 cases of eclampsia and 350 cases of preeclampsics treated in this manner is reported. The gross mortality for the entire series, preeclampsics and eclampsics, is 5.9 per cent. The gross mortality for the active eclampsics is 13.33 per cent and the corrected mortality 9.5 per cent.

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HEMORRHAGE FOLLOWING CESAREAN SECTION*

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OF THE familiar causes of postpartum hemorrhage, atony, lacerations, and retained placental fragments, atony of the uterus alone is significant after cesarean section. Lacerations are excluded, obviously, by the method of delivery employed and complete removal of the placenta should be insured, as there has been ample opportunity to inspect the uterine cavity or explore it manually. On the other hand, the incidence of atony is probably increased because the anesthesia required for cesarean section is deeper and more prolonged than for most deliveries through the birth canal.

Imperfect suturing of the uterine incision incurs an additional risk of hemorrhage in these cases, a risk much greater whenever the incision passes through the placental site. Inaccurate approximation of the edges of the wound may leave open a sinus, divided at the operation, and oozing will continue until thrombosis stops it, unless death

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intervenes. From such a source, indeed, severe hemorrhage becomes possible, though unlikely, since everyone now follows Sanger's advice to close the uterus in layers, approximating its tissues in the same relationship as before the incision was made.

It is inevitable that some bleeding should follow the operation, comparable in amount with that observed after normal delivery. This limit may be exceeded when the uterus has been distended excessively by the pregnancy, or fibroids are present. And still other pathologic phenomena, as we shall see, occasionally favor postpartum hemorrhage. But, whatever its causation, the severity of the complication may be estimated by watching the vaginal discharge, the pulse rate and the blood pressure. These trustworthy guides more often serve to reassure those interested but they may have the opposite influence, giving timely warning of a situation soon to pass beyond control. This has twice been my experience. In one instance death occurred, in the other the patient finally recovered. I shall describe these cases in the order they were met with in practice, the fatal one first.

Mrs. J. H. was delivered twice by cesarean section for a generally contracted pelvis. The first operation was performed under unfavorable conditions inasmuch as a respiratory infection was present. But there was no alternative, for labor had already begun. A febrile convalescence was attributed to bronchitis.

Two years later the second pregnancy proceeded normally to term and again cesarean section was performed under nitrous oxide gas anesthesia. At this operation immediately upon opening the abdomen dense omental adhesions were encountered. Incision of the uterus was attended with profuse bleeding as the placenta was attached anteriorly.

The most momentous finding was a scar three inches long and nearly an inch in breadth. In this area the thickness of the uterine wall was approximately one-third less than elsewhere. The recently made incision was parallel to the former one and more than an inch to the right of it, so that the closure could be made without penetration of the scar by the sutures. Chromic catgut was used and more care taken than usual to assure accurate approximation of the edges of the wound because the problem was an extraordinary one. The patient left the table in good condition; the pulse rate was 120 and the blood pressure 110/70.

Half an hour after she was returned to her room the bleeding became profuse, the pulse more rapid and the blood pressure lower. There was no improvement after appropriate medication or the intravenous administration of salt solution. Consequently, a transfusion of 500 c.c. of blood was given with a highly satisfactory result. But the improvement was only temporary. Another hemorrhage was followed by an exacerbation of the unfavorable symptoms. As a last resort the uterus was packed with sterile gauze which controlled the bleeding for a short interval. Within ten minutes the third severe hemorrhage began; the patient collapsed and died four hours postpartum while preparations were being made for a second transfusion.

Permission could not be obtained for an autopsy. It is unlikely this would have added to what we already knew unless it had disclosed imperfect suturing of the uterine incision. That contingency, I believe, may be excluded as due care was taken in approximating the tissues. To my mind the correct explanation of the

complication was atony of the uterus, especially of the placental site where the normal mechanism for the control of hemorrhage was impaired by the presence of fibrous tissue, the result of imperfect healing after the first cesarean section. So strongly am I impressed with the correctness of this view that in the future when the placenta is implanted over an imperfect scar, it will be my practice to remove the uterus, if the scar may not be excised satisfactorily.

My second experience with postpartum hemorrhage after cesarean section ended more happily. The patient recovered and the cause of the complication was demonstrated beyond reasonable doubt.

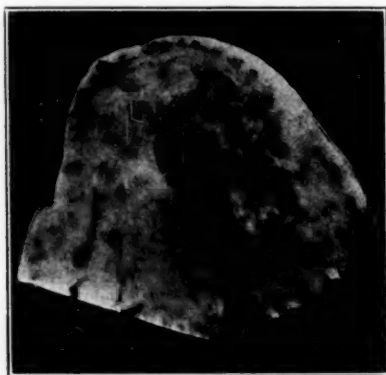


Fig. 1.—Section through the fundus. The black, sharply defined areas are thrombosed veins. The more diffuse, gray mottling is due to intermuscular hemorrhage. Blood clot in the uterine cavity.



Fig. 2.—Horizontal section through placental site. Opening below identifies location of incision made at the cesarean section. The pathologic changes are conspicuous in the lateral portions of the uterus. The central zone appears more normal.

Mrs. C. A., primipara, thirty-one years old, with estimated date of confinement December 12, experienced a miserable pregnancy from the beginning. She reached the eighth month of gestation thoroughly worn out with nausea, vomiting, headache, chronic nasal catarrh, and edema of the feet. The diagnosis of twins was established radiographically and a profound anemia disclosed by the blood count: Hemoglobin 46 per cent, red cells 2,890,000, leucocytes 7000, distributed as follows: polymorphonuclear neutrophils 72.5 per cent, lymphocytes 21.5 per cent, large mononuclears and transitionals 4.5 per cent, eosinophiles 1.5 per cent.

Admitted to the hospital October 30 for rest and recuperation, she was kept in bed and treated for anemia. After five days of medicinal and dietary treatment a transfusion (500 c.c. blood) was given. A typical, though delayed, reaction in-

cluded not only rise of temperature and pulse but headache, backache, chilly sensations, and false labor pains. The urine, previously normal, showed a heavy trace of albumin, and the blood pressure rose from 110/70 to 120/80.

November 6 the temperature and pulse were normal; the abdominal pain, backache, and headache ceased; but the blood pressure and urine findings remained as the day before.

November 7 a blood count demonstrated the benefit derived from the transfusion. The blood pressure was 130/90. The albuminuria became measurable, 1 gram to the liter (0.01 per cent).

November 8: The blood pressure reached 150/100, the albuminuria 0.15 per cent. Sluggish, painful uterine contractions returned. Labor was beginning and the toxemia increasing. A funnel pelvis offered opportunity for further complications and cesarean section was selected as the most advisable method of delivery.

A classical operation was performed by Doctor Henry Shaw and myself under gas anesthesia (7:54 to 8:30 P.M.). The single ovum twins were males. The placenta implanted on the posterior surface of the uterus was removed manually.

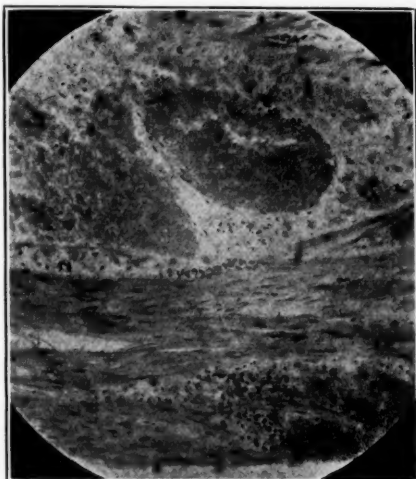


Fig. 3.

Fig. 3.—Microphotograph showing thrombosed vein, intermuscular hemorrhage, and uterine muscle, mostly normal.



Fig. 4.

Fig. 4.—Microphotograph illustrating dissociation of the uterine muscle-cells by the extravasation of blood.

Spontaneous separation had not begun. The uterine incision was closed with chromic catgut in three layers, mucosal, intermediate and peritoneal. Nothing noteworthy was found in the pelvis, except the absence of the left tube and ovary, the removal of which we knew of from the history. The loss of blood during the operation impressed us as excessive and was estimated to be 500 c.c. At the end of the operation the pulse was 100 and blood pressure 110/70. For several hours after operation the patient's condition was satisfactory but at 2:00 A.M. November 9 (five and one-half hours after cesarean section), there was a sudden hemorrhage of about 500 c.c., with characteristic changes in pulse and blood pressure. Transfusion restored the patient, and resulted in a drop in pulse rate to 80 and a rise in blood pressure to 130/90. Two hours later there was a second hemorrhage similar to the first. The pulse became imperceptible, the systolic pressure fell to 70. Shortly afterward the uterus was removed by hysterectomy and 600 c.c. of blood transfused during this operation, performed nine hours after the cesarean section. After a stormy convalescence the patient recovered.

The uterus fixed in formalin was shipped to Doctor J. Whitridge Williams for study. I am indebted to him for the following pathologic diagnosis: "The central parts of both walls of the uterus appeared normal while the lateral portions presented a bluish, mottled appearance suggestive of that found in certain cases of premature separation. The uterine cavity was free. The placental site was identified on the posterior wall. This area on section showed many large vessels, most of which were empty, while others appeared to be thrombosed.

"Sections hardened and stained for microscopic study showed loose edematous connective tissue just beneath the superficial layer of muscle. In places free blood was found in the tissue. Extending through the muscularis were many large thrombosed veins. Numerous small areas of intermuscular hemorrhage were seen which in places had led to marked dissociation of the muscle fibers. Usually such areas were in relation to small veins which they often surrounded completely but nowhere in the specimen could I find endothelial or other changes to account for the escape of blood.

"In general the picture is identical with that noted in certain cases of premature separation, and I am inclined to associate the postpartum bleeding with it and to attribute it to interference with uterine contractions by the intermuscular hemorrhage. In other words, we have the lesions associated with premature separation occurring in a uterus some hours after the placenta has been removed. The existence of a toxemia makes such an explanation even more plausible."

Doctor Williams was impressed by the histologic findings and intended to use them, together with other data, in an essay but an untimely death prevented the fulfillment of his plan. The lesions observed are not unfamiliar but heretofore they have been found only in association with uteroplacental apoplexy. This was first described by Couvelaire in 1912 and, subsequently, studied by Essen-Möller and by Williams whose monographs on the subject beginning in 1915 are well known. The unique interest of the present case relates not only to the development of the lesions independently, without premature separation of the placenta, but also to their development subsequent to delivery. During pregnancy, it is worth while to recall, this patient had experienced no vaginal bleeding. At the time of the cesarean section the placenta was firmly attached to the posterior wall of the uterus and its musculature presented no gross abnormality. For a period of approximately six hours postoperative, the lochial discharge of average amount indicated that the uterus possessed its normal capacity for contractility. All these facts confirm the view that the intermuscular hemorrhages were initiated during the postpartum period, dissociating the muscle cells and depriving them of their hemostatic function. It may be that similar lesions are responsible for other cases of late postpartum hemorrhage, irrespective of the mode of delivery.

The independent nature of the development of the lesions in this instance aids in establishing the sequence of events in cases of uteroplacental apoplexy. As premature separation of the placenta did not initiate the lesions, it seems reasonable to infer that it does not usually

do so. The order of events would appear to be the reverse, namely, first the intermuscular lesions and later the retroplacental hemorrhage forcing the organ from its attachment.

The toxemia, widely accepted, as fundamental in the causation of the intermuscular hemorrhages was present here. On the other hand, torsion of the uterus, another hypothetical explanation, may definitely be excluded. During the interval between the two operations the patient was flat on her back, and subjected to no bodily manipulation likely to cause rotation of the uterus. Furthermore, at the second operation the organ was lying in normal position.

What is the frequency of severe hemorrhage after cesarean section? Stoeckel's comprehensive monograph on postpartum hemorrhage includes a tabulation of fatalities due to atony of the uterus. Of 19 deaths attributed to this complication, 4 followed cesarean operation. Otherwise textbooks are silent and monographs on cesarean section and postpartum hemorrhage alike omit discussion of the subject. Personal enquiry, however, has served to assure me that others have encountered the complication. From a reliable source I learned that several instances have occurred in this vicinity and a friend in the East writes of fatal hemorrhage after cesarean section in one of his patients as well as three more in the practice of a colleague. The literature is mute, I fancy, for a very human reason. Tragic experiences are preferably forgotten, whereas publication makes them memorable. This reflection is not prompted by what may be the negligence of others but by my own psychology. Unless I err in self-analysis, I should not have felt duty bound to record the first case of this report, the fatal one, had not the second revealed pathologic changes worthy of consideration.

With regard to treatment my experience clearly points to the wisdom of resorting to hysterectomy. But this treatment will never be undertaken lightly. The hazard of a second abdominal operation quickly following the first is too familiar to need emphasis. Consequently, conservative measures including the administration of salt solution intravenously and blood transfusion imperatively demand preliminary trial. Yet procrastination, as I have learned, may be of fatal consequence. Therefore, if the benefits of conservative treatment begin to wane, as the pulse and blood pressure will show, the removal of the uterus becomes obligatory.

819 PACIFIC MUTUAL BUILDING

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NICOTINE IN BREAST MILK*

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DURING the past decade an enormous increase in the incidence of smoking among women has occurred. Some eight years ago I estimated that approximately one in five obstetric patients smoked. While I have realized that this proportion was increasing, I was surprised to find that 38 of the last 100 of my patients smoked, the range being from "occasional" to 25 cigarettes per day. "Occasional" smokers averaged less than 1 cigarette daily, and constituted nearly two-thirds of the group. The remainder was equally divided between "moderate" smokers, averaging 1 to 7, and "heavy" smokers, using 8 to 25 cigarettes daily. Whether this growing incidence is another expression of the age in which we live, or is a tribute to the clever advertising and skillful merchandizing of the tobacco manufacturers, or is due to other factors, is, after all, immaterial. It is enough for our purposes to realize the fact that a large percentage of our patients smoke more or less regularly, and to consider what effects, if any, this fact may have particularly upon the physiologic processes concerned in reproduction and lactation.

In 1927 Hatcher and Crosby¹ demonstrated the presence of nicotine in the milk of a nursing mother who had been smoking 20 to 25 cigarettes daily. Their material was obtained under somewhat artificial circumstances, in that the subject, becoming interested in the experiment, was smoking much more than was her custom and used 7 cigarettes in the two hours prior to the collection of the milk. Granted that the conditions under which this test was made were highly atypical, it still is difficult to understand how the importance of their finding has been so generally overlooked, as it is scarcely mentioned by other workers in nicotine research, and seemingly has been missed entirely in obstetric literature.

Under even more abnormal circumstances, Emanuel² reported in 1931 a series of experiments upon the milk and urines of 10 nursing mothers. His patients smoked from 6 to 15 cigarettes within a period of two hours, either inhaling or allowing the smoke to escape slowly through the nostrils in order to secure maximum absorption. He found nicotine in both milk and urine when the subject smoked 7 or more cigarettes within two hours of the obtaining of the samples. This was most con-

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centrated in four to five hours and occasionally was noted seven to eight hours after smoking. The percentage of nicotine in the tobaccos used in this experiment is not stated, but, in general, European cigarettes contain considerably less than do the common American brands.

In this paper, which is to be considered as a preliminary discussion, I wish to report the detection of nicotine in breast milk by ether extraction and biologic test, and to consider whether we should concern ourselves with the tobacco habits of our patients. In the experiments, samples of milk from mothers who smoked were obtained by suction pump at the 10:00 A.M., 2:00 P.M., and 6:00 P.M. nursing periods, and were kept tightly bottled and refrigerated until the extraction was begun. In each instance, as large as possible a sample was secured and all the milk from each patient was used as a single specimen. Patients were asked as to the number of cigarettes smoked during the day, and also as to the brand used, but were not asked to alter either their usual rate or mode of smoking so that nicotine elimination under average conditions might be observed.

METHOD

The extraction of the nicotine in milk was accomplished by modification of the method described by Hatcher and Crosby, and may best be presented by detailing one experiment:

Mrs. B., a primipara, six days postpartum. Smoked 9 cigarettes (nicotine percentage 2.17) and attempted 3 pipesful between 7:00 A.M. and 6:00 P.M. Milk collected at 10:00 A.M., 2:00 P.M., and 6:00 P.M. Total amount, 180 c.c. To the milk was added 11.5 c.c. of 20 per cent sodium hydrate. It was then shaken vigorously with 600 c.c. of ether and separated. The ether addition, shaking, and separation was twice repeated so that the milk was shaken with 10 times its volume of ether divided into 3 portions. To the ether was added sufficient dilute sulphuric acid to make it acid to litmus, enough water added to make a dividing line distinct, and shaken vigorously. The ether was separated, a few drops of dilute sulphuric acid added to it, and reduced by boiling to approximately 15 c.c. This was added to the acid residue of the preceding step and made alkaline by the addition of 20 per cent sodium hydrate, drop by drop. Repurification was accomplished by shaking with 10 volumes (400 c.c.) of ether, separating, adding dilute sulphuric acid drop by drop to the ether until acid in reaction, and concentrating by boiling to approximately 2.0 c.c., the end-stage being over a water-bath. The concentrate was made neutral to litmus with sodium bicarbonate. No odor of nicotine was perceptible. Fifteen minims were injected into the lymph sac of a 20 gm. grass frog. In thirty seconds the frog's respiration became very rapid. In one minute fibrillary twitchings of muscles were noted and the rear feet were drawn up over the body. The pupils were definitely contracted. Next the legs became somewhat paralyzed, and when the frog was held suspended, the hind legs hung crooked across each other in a typical "scissors" effect, while the forelegs drooped with palmar surfaces facing forward. The frog was now pithed, the vagus nerve exposed, and tested with a one-cell induction current produced with the secondary coil 8 cm. from the primary. The pericardium was opened and the heart suffused with the extract. After a few minutes, testing with the induction current with the secondary coil moved down to 4 cm. had no effect, indicating paralysis of the vagal ganglion cells in the cardiac musculature. Index, positive.

The reactions in the frog constitute a very delicate test for nicotine, much more delicate than chemical tests. Not only is it definite, but also a rough quantitative analysis is available. Respiration will be increased in a 20 gm. frog by 0.005 mg. Muscle fibrillation occurs if the dose be increased by one-fifth, and twice the minimal dose will cause the leg paralyses and "scissors" reaction. I am at present unable to state what strength solution is necessary to cause paralysis of vagus ganglion cells in hearts suffused in situ.

In the experiment cited, there was sufficient nicotine to have given two positive frog tests or at least 0.02 mg. This was roughly two-thirds the amount that might have been demonstrated had all the milk been saved for the entire twenty-four hours, since the 10:00 P.M. and 2:00 A.M., and to a lesser extent, the 6:00 A.M. outputs may be assumed also to have contained nicotine. Furthermore, Hatcher and Crosby, in working with measured amounts of nicotine base added to milk and using the standards noted above, were able to recover but from one-eighth to one-half the nicotine present. My patient, therefore, probably eliminated in her milk from 0.06 to 0.24 mg. of nicotine in twenty-four hours at the time of this particular test.

Two other tests suggest that the rate of nicotine elimination may depend upon the degree of breast activity. In the first, a young primipara, on the fifth day postpartum, smoked 5 cigarettes (nicotine content, 2.53 per cent) and secreted 225 c.c. of milk. The frog test was questionably positive, so classed because the entire amount of the final concentration (14 min.) was injected into the frog's lymph sac, giving typical reactions, but the vagal paralysis test was not done. In the second, a young primipara consumed 14 cigarettes (2.17 per cent nicotine) and secreted only 35 c.c., obtained at two pumpings. The concentrate caused the frog to show evidence of shock, but there was not typical muscle twitching or posture, and the vagus endings were not affected by bathing the heart in the extract. This entire latter test, however, loses some significance because the experiment was not promptly completed after the concentration, and the nicotine present might have decomposed.

Thus far, the milk from only four mothers has been conclusively shown to contain nicotine, with positive reactions both in skeletal muscle and vagus cell paralyses. Three other specimens are classed as questionable, although these would be called positives according to the usual standards. In no experiment has a chemical test been positive, nor has the odor of nicotine been noted. This latter test was observed by Hatcher and Crosby. Negative findings under circumstances which would seem to have insured positive tests suggest that the method of extraction and concentration should be improved before attempting a larger series.

As routine, I have advised my patients to moderate their smoking during pregnancy and to abstain entirely during lactation. While the report of Hatcher and Crosby had escaped me, I had noted that nicotine had been detected in perspiration³ and that breasts were considered as modified sweat glands.⁴ Correlating these statements resulted in the hypothesis that lactating breasts would assist in nicotine elimination and gave rise to the questions as to whether the nicotine so excreted would in any way affect the nursing, and whether lactation would be influenced.

Opinions as to the effect of nicotine upon growth vary widely. Chase,^{5, 6} and Hunter and Haley⁷ reported early growth stimulation upon feeding young chicks small quantities of nicotine and tobacco respectively. This view is in harmony with measurements on students at the University of Minnesota,⁸ but is opposed by the work of Richon and Perrin,⁹ and Dixon and Lee¹⁰ on rabbits. Thienes,¹¹ and Behrend and Thienes¹² found practically no effect upon the growth of white mice, white rats, and rabbits when these animals were injected with nicotine in quantities sufficient to cause convulsions. However, when one considers the statement of Cushney that "Nicotine is about as poisonous as prussic acid," it seems logical to consider that even minute quantities of nicotine administered through breast milk might upset digestive processes to the extent of endangering the early growth of delicate babies.

As might be expected, and probably due to personal bias of the various investigators, there is also a wide divergence of opinion as to the possible effects of nicotine upon fertility and lactation. Chiasson¹³ mentions the exceptional fertility and lactation in a group of French families, the women of which were habitual and constant pipe smokers, while Mgalobeli¹⁴ noted in women employed in tobacco factories a marked decrease in the number of pregnancies and increased frequency of miscarriages and infant deaths, all of which he attributed to the direct and indirect effects of nicotine upon the sex organs. Sajous,¹⁵ after recounting a list of symptoms said to be due to nicotine, states that "the ovary of the female habitué shrivels into a small kernel, hard and yellow"; and Greenhill¹⁶ comments, "Animal experimentation has proved that nicotine can produce disastrous results in females and their offspring. Without doubt excessive smoking effects women more than men." H. C. Williamson, H. S. McCandlish, and Ogden Conkey, all of the Department of Obstetrics of Cornell Medical School, informed Hatcher and Crosby that they had never noted any diminution in the secretion of milk, nor any effects upon a child that could be ascribed to smoking by the mother. Emanuel did not find that lactation was decreased by excessive smoking, but, because two infants had slight gastrointestinal upsets, which might have been due to nicotine, he concluded that not more than 15 cigarettes should be permitted the nursing mother. At the present time I have one patient who states that 20 to 25 cigarettes daily did not hinder her from producing an over-supply of milk during two lactation periods, and another patient who reports the same concerning her sister; but, on the other hand, I have yet to observe a patient averaging 8 or more cigarettes daily whose lactation was adequate at three months.

The direct evidence upon animals is scant but highly suggestive. Hatcher and Crosby found that injection of large amounts of nicotine into a cow and a lactating cat caused a temporary suppression of secretion which lasted some hours. Small doses, according to Cushney, give a temporary stimulation of secretions, followed by a depressed activity.

One of the difficulties encountered in securing milk samples was that in several instances breasts were relatively inactive on the days testing could be done. Due to limitation of available time, collection of the milk was most convenient if done on Sunday, so that extraction could be begun Monday, and completed on Wednesday. Samples earlier than the fifth or sixth day postpartum were difficult to handle because of the ether-soluble constituents of colostrum, and it was not unusual to find that practically no milk could be expressed on the ninth to twelfth days. The patient mentioned earlier, whose milk gave a negative test after 14 cigarettes, secreted but 35 c.c. during the eleventh day postpartum, but she was a particularly excitable individual, and her nervous instability probably was the major factor in her inefficient breast function. Hateher and Crosby's subject had had an abundant output at first which dwindled rapidly to less than an ounce per nursing on the eighth day. One is sorely tempted to conclude that excessive smoking does influence milk production adversely.

Limitation of smoking purely upon the number of cigarettes consumed daily can have but little value. Some individuals toss a cigarette aside when but a third is burned; others, not until the stub can scarcely be manipulated. Bogen¹⁷ has shown that rapid smoking causes complete disappearance of nicotine from the smoke at the burning end of the cigarette, and, consequently, almost the entire nicotine content of the tobacco is drawn into the mouth. Absorption of the nicotine is much greater if the smoke is inhaled rather than being expelled from the mouth. The nicotine content¹⁸ of the tobaccos varies widely, so that one must consider the brand used. These and other factors make it extremely difficult to formulate safe and sane standards.

Among primitive peoples a woman either nursed her young or it died. In this manner, if one may use a dairyman's terminology, only the heavy-milking strains were continued, and the light-milking strains were bred out. With the solving of most of the problems of artificial feeding of infants, the absolute necessity for adequate lactation has been abolished, and an increasing number of women refuse the burden and inconvenience of producing food that can be secured from cows and laboratories. It is not my belief that the effect of nicotine is the sole or even the chief factor involved in diminished lactation. Nothing will much more rapidly reduce milk production than hysteria. Usually it is the nervous, excitable woman who smokes; and usually it is the nervous, excitable woman, who, whether a smoker or an abstainer, has a deficient milk output. The two traits, however, are so frequently noted in the same woman that it is easy to draw conclusions which may be erroneous.

SUMMARY

The elimination of nicotine by lactating breasts, confirmed by biologic tests, has again been demonstrated. From a review of available literature and from personal observation, it would appear that smoking in moderation probably is a minor factor in influencing lactation. While excessive smoking and adequate lactation usually are not noted in the same individual, as yet there is insufficient evidence to conclude that the one is the cause, the other the effect. Due to possible, unproved effects upon the digestive processes of the infant, excessive smoking should be forbidden the nursing mother. The impression, frequently recorded, that women who smoke usually do so to excess would seem to be as inaccurate as impressions generally are.

I am greatly indebted to various colleagues for permission to obtain milk samples from their patients; to the nurses of the Obstetrical Departments of the Hollywood and Cedars of Lebanon Hospitals; and especially to Dr. C. H. Thienes, Professor of Pharmacology, without whose counsel and cooperation this work would not have been done.

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THE TREATMENT OF PROLAPSUS UTERI, WITH SPECIAL REFERENCE TO THE MANCHESTER OPERATION OF COLPORRHAPHY*

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IT WOULD seem almost necessary to apologize for writing another article upon such a well-worn subject as the treatment of uterine prolapse, but the very fact that so much is still written about the treatment of a condition well described by Galen, is proof that no one method has been universally accepted as a cure of all cases.

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In some centers various forms of vaginal operation are performed, in others some form of abdominal operation, in others a combination of vaginal and abdominal operations, while in others again several types of operation are used, each being specially reserved for patients of a certain age, parity, or social position.

My excuse for writing another article is that in Manchester for a continuous period of forty-five years one type of operation, always with the same general principles though with varying minor technical details, has been performed by a large number of gynecologists, upon all patients with prolapsus uteri, irrespective of age, social position, or parity, and that the results allow more nearly a guarantee of cure to be given to the patient beforehand than does any other operation performed in surgery.

Marshall Hall of London seems to have been the first to suggest narrowing of the vagina, but there is no record that he performed the operation himself.

Heming in 1831 operated upon the anterior vaginal wall and was followed by Kilian, Marion Sims, Emmett, Savage, Aveling, Morton and Gaillard, Thomas, etc., all with various modifications and each claiming fairly good results.

Now when operations are more or less standardized so that it is necessary to quote large numbers to prove that one method is superior to another, it is only by reading the records of these earlier operators, written by themselves, that we can in any way realize the amount of original thought, manual dexterity and self-confidence which each advancing step required.

Marion Sims' description of his first anterior colporrhaphy is a striking illustration as, in order to cure the prolapse, he was quite prepared to risk the production of a large vesicovaginal fistula and to trust to his own ability to close this at a later stage. By sheer good luck this was avoided and an operation devised which could be performed by disciples with less skill and confidence.

Operations upon the posterior vaginal wall and perineum were performed by Hegar, Simon, Emmett, Martin, etc., and the cervix was amputated by Huguier, Coupil, Sims, etc., but no one seems to have combined these three operations until some members of the Staff of the Women's Hospital attached to the University of Berlin and Donald of Manchester independently began to do so in 1888.

Marion Sims, in the 1886 edition of his celebrated book, states that for the treatment of prolapsus uteri there are three surgical processes from which to choose. (1) Amputation of the cervix, (2) perineal operations, or (3) narrowing the vagina by the trowel or triangular-shaped denudation of its anterior wall as performed by Emmett and himself; while the 1890 edition of Hart and Barbour contains this statement about perineorrhaphy, "These operations help, at least, by enabling the patient to wear a ring pessary"; and that apparently was the object for which the operation was performed.

In 1888, Cohen¹ published the results of 105 cases of prolapsus uteri treated by colporrhaphy by Olshausen and Carl Schröder. In some of these cases only anterior, in others only posterior colporrhaphy was performed, but in a few these two operations were combined. Of the whole series he claimed 56 per cent of cures, but he had two fatal cases.

In this same year (1888) my old chief, Donald of Manchester, commenced, quite independently, to treat these cases by the combined operation of anterior and posterior colporrhaphy and amputation of the cervix.

Manchester, the center of a large industrial area in which much female labor is employed, has more than its fair share of cases of prolapsus and Donald, while the Senior Resident at St. Mary's Hospital, had been much impressed by the failure of plastic surgery to cure these cases; in fact the prevailing opinion of the Staff at that time was that these cases were incurable, and that the very best result which could be hoped for was sufficient narrowing of the vagina to allow of the retention of a pessary.

A study of these failures convinced Donald that success could only be attained when the narrowing of the vagina was obtained by suturing the deep structures as well as the superficial, and that some absorbable suture material was required for this purpose.

Donald's first two operations were performed on April 28 and July 18, 1888, silver wire being used as the suturing material as was the common practice at that time.

About this time he heard that in Germany a new absorbable suture material, catgut, was being tried in general surgical work and having obtained some, sterilized in carbolic oil, he performed his third operation on Aug. 3, 1888. In this case he did an anterior colporrhaphy with a wide diamond-shaped incision, and drew the deep tissues together with a buried spiral suture of catgut. A fortnight later a posterior colporrhaphy was performed and the deep tissues, as in the anterior colporrhaphy, closed with buried catgut. On August 30 the patient was discharged, and to quote from the notes "the wound was healed and the outlet of the vagina only admitted two fingers with difficulty. No pessary was inserted."

Two other patients were operated upon in that year, making 5 in all, the same number in 1889, 6 in 1890, and only 3 in 1891, but the results were obviously improving, and he was gradually becoming convinced that this operation could be used as a cure and not merely as a means to retain a pessary, as there is a note to each of the cases in 1891 that the patient went home without a pessary, whereas in previous years this note was only added to one case in each year.

In all these cases anterior and posterior colporrhaphy were combined, and in a large number the cervix also was amputated.

From this time onward, Donald had established his routine procedure for the treatment of prolapsus uteri, anterior and posterior colporrhaphy with amputation of the cervix, and the suturing of the deep muscular tissue with buried catgut. This operation he performed upon all patients with this condition, irrespective of age or parity, and so good were his results that his colleagues gradually

adopted his procedure, and when I first became his House Surgeon in 1904, every member of the Staff had followed his lead and it was some years before I saw a case treated in any other way.

Donald, I am glad to say, is still with us in active work, but many of his colleagues have fallen by the way, and so there have been a considerable number of gynecologists on the Staff of St. Mary's Hospital during the succeeding forty-five years, but, with the exception of two, all have adopted this method of treatment of uterine prolapse, modified in detail, but with the same essential principles, and it is doubtful whether any other center can show such a long continuous method of treatment for this common complaint by such a large group of operators.

At a later period Fothergill^{2, 3, 4} modified the operation by making the incision of the anterior colporrhaphy triangular in shape, with a wide base near the cervix and by a circular incision round the cervix he combined the amputation of this organ with the anterior colporrhaphy. This was only a technical modification of Donald's original operation, but it had the advantage of exposing more widely the important tissue at the base of each broad ligament, and removed the bridge of vaginal tissue left between the cervical sutures and the anterior colporrhaphy when the former is removed by the classical Schröder's amputation before the anterior colporrhaphy region is denuded.

Unfortunately, Donald did not publish until many years later⁵ a description or results of his operation: it was accepted by his colleagues and later by all his pupils; many visitors saw him perform the operation and the results were so excellent that he took it for granted that all would adopt it. It is in the wide publication of Fothergill's papers that the gynecologic world has heard the details of this operation, and through him that it has been adopted as the routine treatment in many centers.

ETIOLOGY

The uterus is described as having eight ligaments, but it has long been recognized that these are of no importance in maintaining the position of the uterus, which depends entirely upon the tone of the pelvic floor. This plane of muscular and connective tissue stretches across the pelvis in well-defined bundles, many of which are inserted into the uterus about the level of the internal os. The strongest portion of this tissue forms a thick bundle which runs at the base of each broad ligament a little below the uterine artery, but other important fibers run backward from the cervix to the sacrum and forward to the pubic arch, and on a lower plane these are connected with the levator ani and other muscles of the pelvis.

That these muscles are responsible for the support of the uterus is seen every time the operation of hysterectomy is performed. If the uterus is firmly grasped and pulled upward, no additional mobility is given when the broad ligaments are cut and the bladder separated from the cervix, but as soon as the tissue immediately below the uterine artery and that at the base of the uterosacral ligaments is cut, the uterus can be drawn from the pelvis a considerable distance. It is this tissue then which suspends the uterus in the pelvis, and it is only possible for the uterus to descend if this tissue is overstretched, torn, or otherwise weakened.

This tissue has been long recognized by the anatomists, but it was I think Fothergill's racily written paper in 1908⁶ which called wide attention to this fact; certainly this was so in my country, and I am taking it for granted that this is now accepted by all gynecologists.

Weakness of the pelvic floor then is an essential condition in uterine prolapse, but there are many secondary causes which increase the degree and the rapidity of its occurrence, such as increased intra-abdominal pressure from tumors or chronic coughing or heavy work, increased weight of the uterus with fibroids or subinvolution, or a heavy cervix due to a fibroid or chronic cervicitis, and one or more of these secondary factors is commonly present in each case.

Parturition is the common cause of a weak pelvic floor and so the majority of these patients with prolapsus uteri are parous women, but it does occur in virgins, though much more rarely. In these patients there is some developmental weakness of the pelvic floor, but in addition to this, there is generally some secondary cause, and this accounts for the fact that these cases of prolapse in virgins occur chiefly in the industrial North where such a large number of women do heavy work in the mills.

SYMPTOMS

The most common symptom is the sensation of "something coming down," but before this stage is reached a considerable number of patients suffer from aching, dragging pain in the lower part of the abdomen and the back when standing or undertaking physical work. In these cases the laxity of the pelvic floor is still of slight degree, but enough to allow the uterus to prolapse when the patient undertakes heavy work, and in this way to drag upon supports which normally should be quite free.

In all cases in which the patient complains of this aching pain in the back or lower abdomen when standing or working, the pelvic floor should be carefully investigated and if this is found to be unduly lax, a well-designed colporrhaphy will usually cure this symptom.

In cases in which there is damage to the muscular fibers running from the cervix to the pubic arch, cystocele is produced and the pa-

tient frequently complains of incontinence of urine, especially when she strains.

TREATMENT

Up to the end of last century the common treatment for these cases was the insertion of some form of pessary, which the patient was condemned to wear for the rest of her life, and unfortunately even now some members of our profession do not seem to realize that this condition is curable, and they still persist in the use of these insanitary, inefficient instruments. Often no doubt they are influenced by the fact that the patient objects to an operation, and when they find that an instrument makes her comfortable, they leave it at that. What they do not realize is that some years later, when the pelvic muscles atrophy, there is a strong possibility that this instrument will fail to keep the patient comfortable, and when she is sixty or seventy years of age, she may find herself so uncomfortable that she will then demand an operation which could have been performed many years before, when she was more able to stand the strain and thus have avoided this long use of these disagreeable instruments.

Every year I operate upon a considerable number of women over sixty, and a few over seventy years of age. On several occasions I have been asked to operate upon women over eighty years of age, who were completely bedridden with a condition which should have been cured many years previously: in each of these cases I have found the patient's condition so enfeebled that operation was then out of the question, but one of my colleagues has successfully performed the operation upon a patient eighty-five years of age.

The only type of patient in whom it is justifiable to use a pessary is the young woman who still hopes to have more children. In these cases a pessary can be used if it makes her comfortable, though a colporrhaphy should be done as soon as her family is completed. Many of these patients dislike the use of pessaries and prefer to have a colporrhaphy performed, even though there is some risk of a recurrence in subsequent labors, a risk, as I shall show later, of less than 25 per cent.

Many operations have been devised and are still used for the treatment of this condition, and these may be classified into five groups: (1) Some form of hysterectomy. (2) Some form of abdominal uterine fixation. (3) Some form of vaginal interposition operation. (4) Le Fort's operation. (5) Colporrhaphy.

Hysterectomy as a cure for prolapse is useless and the very worst type of prolapse is the one which occurs after hysterectomy has been performed.

If great care is taken to close the gap in the pelvic floor by stitching together the muscle bundles which were inserted into the uterus, a

vaginal hysterectomy can easily be performed along with the colporrhaphy, but this is done merely because the hysterectomy has to be performed and can be easily combined with an anterior colporrhaphy, and it is not done as a cure for the prolapse.

Abdominal uterine fixation is still done in many schools but by itself it is quite useless. Combined with the colporrhaphy it is very seldom required, and only in those cases where the musculature of the pelvic floor is so deficient that it is incapable of supporting the uterus even when it is shortened and strengthened to the fullest extent.

Of vaginal interposition operations I have no experience. They must be performed only in those patients who are past the menopause or combined with some method of sterilization.

This means that the majority of the patients are elderly and less well able to stand a severe operation, and if Frankl's statement in a recent article is correct that "a carefully performed operation for an extensive prolapse requires for its performance ninety or more minutes" it cannot compare with a colporrhaphy which takes only thirty minutes.

Le Fort's operation was a very ingenious device, and I understand it was successful in many cases, though it had obvious objections, and I am doubtful if this operation is now ever performed.

Our last group is colporrhaphy, and if we agree that the primary cause of the prolapse is a weakness or stretching of the pelvic floor, it seems logical to treat this condition by tightening and strengthening the pelvic floor as only a properly performed colporrhaphy can do.

TECHNIC OF THE OPERATION

In this description of the operation I follow in detail my own method of performing it, which in general principles is the method I learned from my old teacher, Dr. Donald, modified in some details by the late Dr. W. E. Fothergill, and again in a few details by myself.

The patient is placed on the table in the lithotomy position, the vulva shaved, and this and the vagina thoroughly cleansed with soap and water and then with surgical spirit and a solution of iodine. The cervix is then grasped with the vulsellum and the canal dilated. This dilatation is necessary, as at a later stage sutures have to be inserted through the cervical mucosa. In practice, I always curette the uterus, to make quite sure that there is nothing abnormal in its interior.

I think the shortest and clearest method of description will be to follow the illustrations.

Fig. 1 shows the method of stitching back the labia minora. A sterile towel with an opening somewhat larger than the vulva is placed over the patient, a weighted speculum inserted into the vagina, and a stitch inserted through the towel and subjacent skin of the buttock and then through the labium minus. When this is done on both sides, the labia are drawn well away from the vagina and so give a good view of the field of operation, and present a smooth surface which is more easily sterilized. This illustration shows the left labium minus stitched to the buttock.

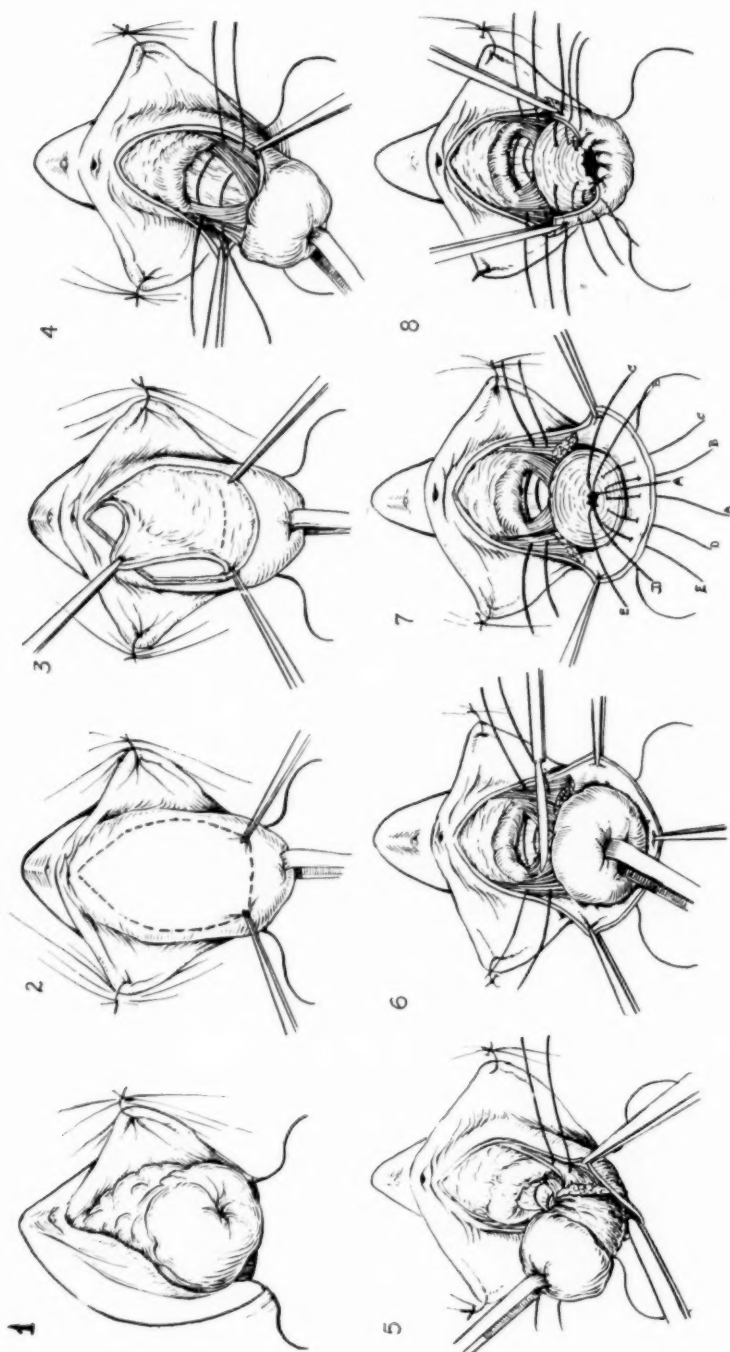


Fig. 2 shows both labia minora stitched outwards. The cervix is grasped with a vulsellum, pulled downward as far as possible, dilated, and the uterus curetted. A pair of Spencer Wells now grasps the vaginal mucosa on each side of the cervix, as far apart as it is judged necessary to make the base of the denuded area. This is a matter of experience, and can only be judged correctly with practice. A triangular area is then marked out with the scalpel with its base near the cervix and its apex below the urethra, but the sides of the triangle are not quite straight as it is necessary to have the denuded area a little wider in the center of the vagina than at the base.

In a complete procidentia it is possible to mark out the whole triangle before separating any of the mucosa, but in cases of partial prolapse it is best to first mark out the lower portion and dissect this from the subjacent tissues: during this process the folds in the remaining portion of the vagina are smoothed out, and the outline of the triangle can be more easily completed. In practice, the base of the triangle is usually made somewhat wider than this drawing.

Fig. 3 shows the dissection of the vaginal mucosa from below upward. In a case of complete procidentia it is possible to commence the dissection from the urethra downward, but in cases of partial prolapse it is much easier to commence at the base of the triangle near the cervix, and so I prefer to make this a routine practice in all cases.

Fig. 4 shows the triangular area denuded of mucous membrane. The few fibers of muscle and connective tissue which fix the bladder to the cervix have been cut and this organ has been dissected up from the cervix. This exposes the muscular tissue at the base of each broad ligament, and with a needle it is possible to encircle a mass of this tissue on each side. This sketch shows two sutures inserted, each of which includes a portion of this tissue on both sides. When these sutures are tied, this tissue from each side will be drawn to the front of the cervix, and therefore this portion of the pelvic floor will be shortened by this amount. The ligatures are not tied at this stage, but it is convenient to insert them while the tissues are visible.

In the majority of cases, the suturing of this material in front of the cervix is sufficient to keep the uterus anteфлекed, even though it was previously retroфлекed, but in a few cases where the uterus is very heavy these sutures transfix a small portion of the anterior wall of the uterus, and so keep this organ in the anteфлекed position while the healing process takes place.

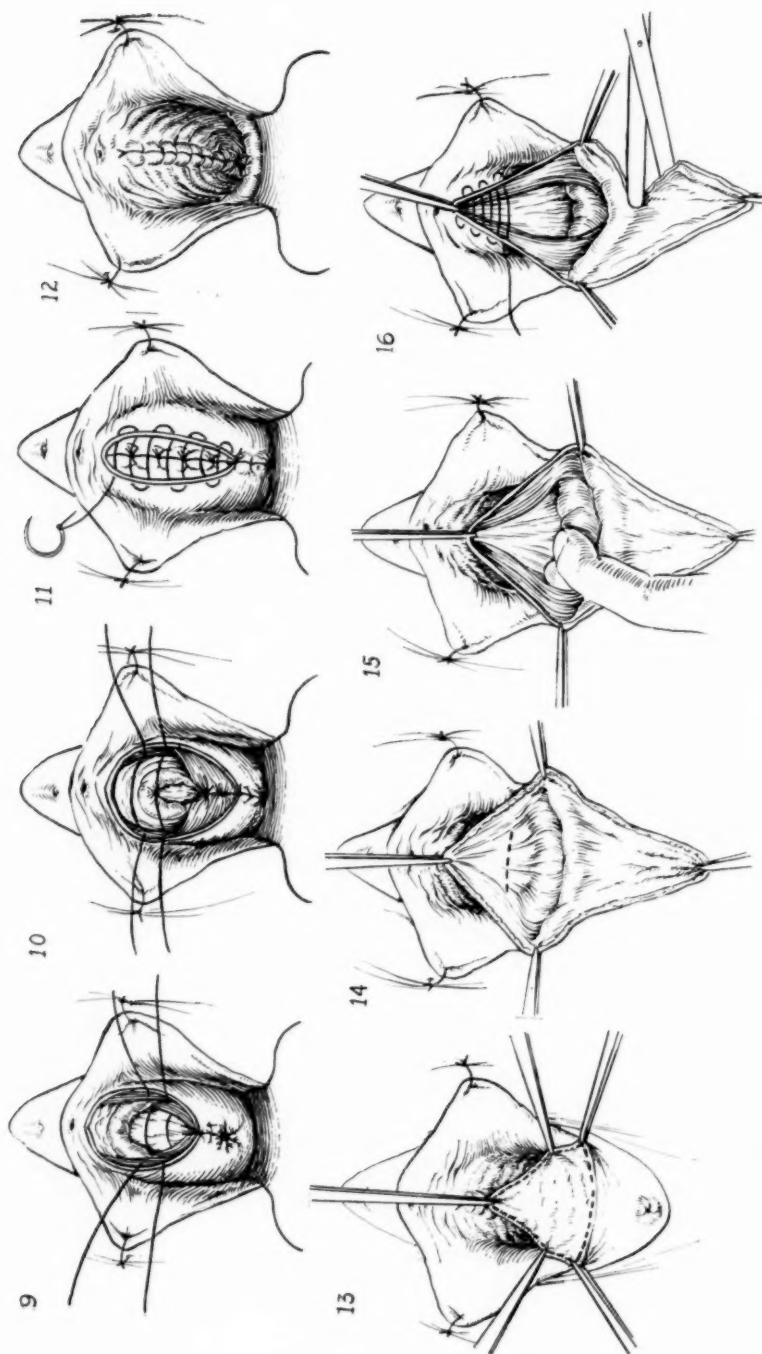
Fig. 5: The cervix is drawn forward to show part of the posterior surface. An incision is made through the vaginal mucosa from one pair of Spencer Wells round the back of the cervix to the pair of Spencer Wells on the other side, and the mucosa is stripped from the cervix for a distance varying with the amount of cervix which requires amputation.

Fig. 6: The cervix is still grasped with the vulsellum. The vaginal mucosa has been dissected from the cervix and the scalpel is shown in position, ready to amputate the denuded portion of the cervix.

Fig. 7: A portion of the cervix has been amputated. Sutures are now inserted through the cervix and the vaginal mucosa, and when these are tied the edge of the vaginal tissue will be brought into contact with the cervical mucosa.

Fig. 8: This is a later stage with a few of the sutures tied. Finally a suture is passed through one angle of the mucosa, transfixes the center of the anterior wall of the cervix and finally the other angle of the mucosa, and when these and a few intermediate sutures are tied the external os is completed.

Fig. 9: This shows the external os completed. Instead of a triangle, the denuded area is now of an oval shape, as the angles at the base have been brought together at the center of the external os. By means of a continuous suture, the cut edges



of the mucosa are brought together up to the level of the insertion of the two deep sutures. At this stage the uterus should be examined, and if it is retroflexed the body should be replaced. The two deep sutures which in Fig. 4 are placed around the musculature at the base of each broad ligament can now be tied, and if a ligature has been left on the cervix it will be found that no reasonable amount of traction will now pull the cervix down, as the deep sutures shortening and tightening this part of the pelvic floor prevent any further descent of this organ.

Fig. 10 shows the two deep sutures tied and others inserted in the deep muscles at the base of the bladder. These additional sutures should always be inserted, and are especially important in those cases in which the patient suffers from incontinence of urine.

Fig. 11 shows these deep sutures tied and a continuous suture inserted in the vaginal mucosa to complete the closure of the original incision.

Fig. 12 shows the completion of this stage of the operation.

Fig. 13 shows the method of marking out the flaps of the posterior colporrhaphy. The redundant tissue in the posterior fornix near the cervix is grasped by a pair of forceps, and when this is pulled forward the tissue falls roughly into a triangle, with its base on the perineum, but it is usually necessary to make the center of the triangle as wide or almost as wide as the base, and this portion is marked out on each side by a pair of forceps, while the angle on the perineum is marked on each side with another pair. In practice, it is easier to denude the triangle down to the middle forceps and to control bleeding by stitching these edges together before completing the triangle down to the perineum.

Fig. 14: This shows a triangle of vaginal mucosa dissected from the subjacent tissue. It also indicates the line of the rectum with some fine fibers of connective tissue attaching it to the vagina. The dots indicate the line through which these adhesions are incised.

Fig. 15: The attachments of the rectum have been cut, and the rectum itself separated from the vaginal wall. This is the most important step in the operation, as without it, it is impossible to fill in the space between the vagina and the rectum with muscle, and if this is not done the vaginal mucosa will stretch and will bring forward the rectum as a recurrent rectocele.

Fig. 16 shows the continuous suture drawing together the upper edges of the triangle, and in practice this is usually completed before the remainder of the triangle is dissected away. This sketch shows the completion of this dissection with a pair of scissors cutting away the mucosa from the perineum. It also shows the rectum separated from the vagina, and on each side folds of muscular tissue which must be brought together by means of deep sutures. If the posterior colporrhaphy is carried sufficiently high the upper portion of this muscular tissue is part of the pelvic floor running at the base of the uterosacral ligaments and the tissue a little lower represents the levator ani muscles. The most important part of the posterior colporrhaphy is the suturing together of these deep layers of muscular tissue.

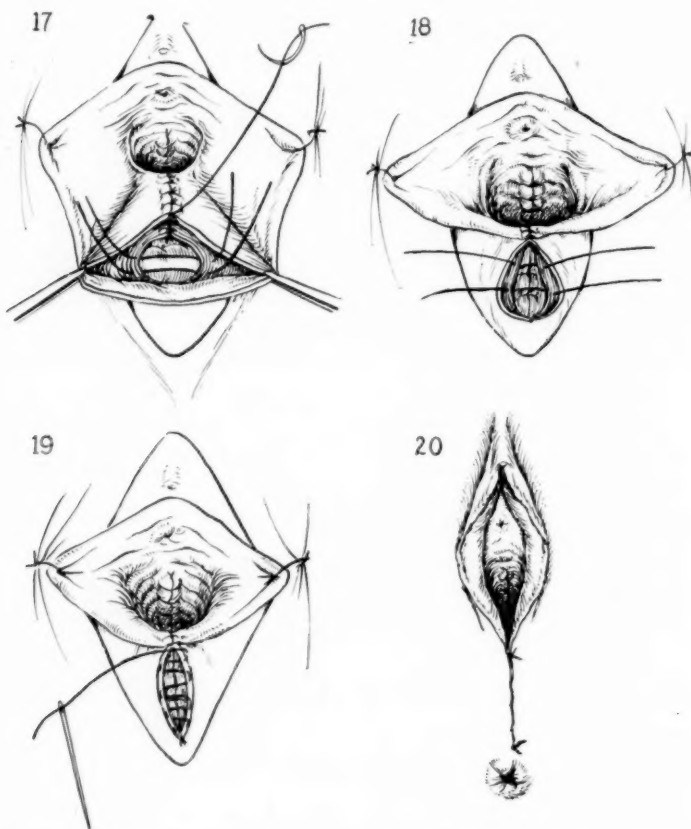
Fig. 17 shows the upper portion of the edges of the triangle drawn together by a continuous suture. It also shows a few sutures inserted into the deep muscles. In the central area the rectum can still be seen but this space will now be closed by other deep sutures inserted into the muscle.

Fig. 18 shows the completion of the suturing of the long sides of the triangle. The angles at the base of this triangle are brought together at what will be the center of the new vulval outlet. As the vaginal edges are sutured, successive layers of deep muscle are folded together, and these are bound firmly together by means of deep sutures, usually in three different layers. In this sketch, the vulval outlet is completed, one layer of sutures in the deep muscle are shown tied and another layer inserted ready for tying.

Fig. 19: The edges of the skin on the perineum are brought together by a continuous subcuticular suture. The labia minora are still sutured to the buttock.

Fig. 20 shows the completion of the operation. The sutures holding the labia minora have been cut, and the edges of the skin of the perineum brought together.

Throughout the operation, nothing but catgut is used as a suture material, and so there are no stitches to be removed during convalescence. It must be emphasized that the most important part of the operation both in the anterior and the posterior colporrhaphy is the suturing of the deep muscle, as this shortens and strengthens the whole of the pelvic floor, the tissue which alone keeps the uterus in position. The excision of the vaginal mucosa merely removes tissue which otherwise would



be redundant and gives access to the deep musculature; and the suturing of this vaginal mucosa is done only with a continuous suture and merely to promote quick healing and to control the oozing. This tissue itself is of no value in keeping the uterus in position, and if the pelvic musculature is not firmly sutured the prolapse of the uterus will quickly recur.

RESULTS

After 1888, when Dr. Donald first combined anterior and posterior colporrhaphy with amputation of the cervix for the cure of prolapsus uteri, he and his colleagues very soon adopted it as the standard operation for the treatment of this condition, and from that date

until now only a small percentage of cases in Manchester have been treated by any other method.

During this period there have been many changes on the Staff of the Hospital, but as each member in turn adopts this method of treatment, this is the strongest proof of the good results obtained by it.

In technical detail each operator has some slight modification, but in general principles the operation remains the same.

The method I have described above is the one which I use myself. It is somewhat modified from that used by Dr. Donald and the one described by Dr. Fothergill, and probably none of my colleagues will describe the operation in exactly the same way, but essentially these are all the same, and there is very little difference in the results obtained by any of us.

In 1921⁴ the late W. E. Fothergill published the results obtained in 156 cases. These showed 97 per cent free from recurrence, and of the 4 patients who showed some recurrence, two had had children since the operation. At the same meeting my colleague, Dr. F. H. Lacey,⁸ reported the results obtained in 521 patients operated upon by members of the Staff of St. Mary's Hospital, Manchester.

Of these, 87 per cent of the patients reported that they were cured, but this percentage is really much too low, as a large number of those whose replies were unsatisfactory failed to come for further examination, and so were included as failures, whereas of those who did come for examination, a large percentage had no prolapse and were complaining of symptoms not connected with this condition. In many other cases there were special reasons for the recurrence, so that the correct percentage of nonrecurrences was much higher than 87 per cent.

In 1930⁹ I published the results which I had obtained in 293 patients operated upon at least three years prior to the date of the investigation, and for the purpose of this paper I have attempted to follow up my patients for the next three years, 1927, 1928 and 1929, all of which again have been operated upon for a longer period than three years, and in this paper I am adding the results of these two investigations.

Unfortunately in our country we have no "follow-up" system in our hospitals, and whenever we desire to investigate the results of a large series of cases, we find it impossible to make this a really consecutive series, as so many patients have left their old homes and cannot be traced. This is especially so where a long interval has elapsed since the operation, as must be the case after colporrhaphy, as recurrence necessarily takes some time, and results calculated from patients operated upon at a recent date will be too good. In this series at least three years has elapsed since the operation in each case.

In this new series, though every endeavor has been made to trace the patients through their friends and doctors, I have only been able to obtain replies from 256 out of 324 to whom a questionnaire was sent.

With a condition like prolapsus uteri, where a good result means freedom from symptoms to the patient, I have counted as a cure all those cases in which the patient has filled up the questionnaire to say that she is quite free from symptoms of "bearing down." Those whose replies are not quite satisfactory I have personally investigated, as I find that many of these, especially hospital patients, report numerous complaints which have no connection with their pelvic organs. I am including in the failures those in which there is the slightest degree of recurrence or redundancy of the vaginal tissues and also those whose replies are not quite satisfactory but who have failed to report for further investigation. Probably these would be found to be suffering from some other condition, but as I have not been able to examine these patients, it seems fairer to include them in the failures.

In these two series combined, I have replies from 549 patients, and this is the figure from which I have calculated my percentages in the following paragraphs.

Prolapse of Uterus or Vaginal Walls.—In this combined series of 549 cases the results are:

Completely cured	529, or 96.35 per cent
Unsatisfactory	20, or 3.64 per cent

Of those whose results are not satisfactory, 5 had subsequently borne children, and the parturition is most probably the cause of the recurrence; 4 failed to come for further examination and so are recorded as failures; one had a definite hernia through the vaginal scar as recorded later; and 8 showed some laxity only of the posterior fornix, a condition which is discussed below.

Apart from those who had subsequently borne children, only 4 had symptoms sufficiently severe to warrant any further operative treatment (0.75 per cent).

Mortality.—One of the great advantages of this operation is the very slight risk to the patient. In the six years included in this investigation not a single death occurred.

In the twenty-six years during which I have performed this operation, I can find in my hospital and private records only 9 deaths, one from pneumonia, one from heart failure, one from embolism, one from septic absorption from a piece of gauze retained in the uterus, one from pyelitis due to operating too soon after an attack of cystitis, and in 4 the cause of death was not noted in the records.

Two of these deaths could have been avoided, and in each case I learned a practical lesson. In one of these, a very early one, I operated in the patient's house, and following my usual custom up to that time I packed some gauze into the uterus and around the cervix and asked the patient's own doctor to remove this on the following day. A week later I was asked to see her again and found her dying from septic absorption, due to a piece of gauze retained in the uterus, which had broken off when the doctor had removed the gauze the day after the operation. Since then, I have never packed the uterus. The death from pyelitis also taught me a lesson

and since then I have been very careful not to operate upon a patient with any signs of cystitis.

During these twenty-six years I have records of 2152 cases upon whom I have performed the operation, and so the mortality is only 0.37 per cent.

Chronic Pain.—Chronic aching pain in the lower abdomen and back is one of the most troublesome complaints which we are called upon to deal with, as it may be due to so many different conditions. One of these is the early stage of prolapsus uteri, where the pelvic floor has been stretched so that when the patient stands for any length of time or undertakes heavy work the uterus is driven down for a certain distance, and she complains of chronic pain long before she is aware that there is any definite bearing-down. Every patient who comes to us with this symptom should be carefully examined to see whether she has an early stage of prolapsus uteri, and if this is found, its cure by a colporrhaphy will probably cure her pain.

In this series, I find that 56 patients definitely complained of chronic aching pain, and of these 49 were cured, 87.5 per cent, and 7 not cured, 12.5 per cent.

Incontinence of Urine.—In this series there were 17 patients who complained of incontinence of urine on straining, and of these three were not cured.

This is a large percentage of failure for this particular symptom, but it is only what might be expected, as it is often impossible to find a satisfactory amount of muscle at the base of the bladder and urethra, and even when this is found and brought together by deep sutures, it is a tissue which seems specially prone to stretch.

Subsequent Parturition.—When a patient is advised to have this operation, knowing that it was produced in the first instance by parturition, she frequently asks this question, "Will it recur if I have other children?"

As the operation replaces the pelvic muscles as nearly as possible into their original condition, it follows that there is considerable risk of recurrence, and as a result, there is a tendency for us to defer this operation until the patient has reached an age when she is not likely to have more children, or when she has made up her mind that she has as many as she desires. Consequently it is impossible to collect a long series of cases in which labor has occurred after a colporrhaphy has been performed.

In this combined series, I find that only 27 had children after the operation, and this is a very small number in which to calculate percentages, but of this number only five showed any signs of recurrence, that is, 18.5 per cent, and I am doubtful whether a series of primiparas would show any greater freedom.

If a patient does become pregnant after a colporrhaphy has been performed, care must be taken during parturition to give the soft parts ample time to dilate, and if this is done the chances of recurrence are comparatively small.

What is perhaps of more importance is whether succeeding labors will be more difficult. One early argument against this operation was that the scarring of the cervix would produce great delay in the first stage. In practice this has proved to be wrong. It may be that in an odd case there is some trouble, but of the patients whom we have subsequently admitted to St. Mary's Hospital for confinement, we have not had any trouble, nor have I had any complaint from any practitioner who has subsequently attended any of my patients. In fact, in many of the cases the first stage is definitely shortened, due to the fact that there is a smaller amount of cervical tissue to dilate, and as illustrating this I give the notes of a case which was recently under my own direct care.

This patient in her early twenties had two children, both very small, and each time long protracted labors, of about thirty-six hours. Evidently great delay in the first stage, and final delivery with forceps.

Subsequently I did a colporrhaphy for prolapsus uteri, and a little later her husband died. For ten years she remained in widowhood and then remarried and became pregnant. The vagina was fairly narrow, she was forty years of age, and the new husband was a big man, and consequently I was prepared for trouble at the confinement, and it was arranged that she should come into my Nursing Home.

Labor, however, commenced a few days before the calculated date, and as there was a thick fog that night and the patient lived 70 miles away, it was impossible either for her to come into my Home or for me to go to her, and I advised her doctor to give her sedatives, and we would decide the next morning whether to move her or not. By breakfast time the next morning, eight hours after the first labor pain, she delivered herself without aid of a large healthy son.

Of these 27 cases in this series who subsequently had children, one is described as having a long labor, and all the others quite normal.

Results After the Menopause.—The results of this operation are equally good whatever the age of the patient, and in this series are included patients ranging from sixteen to seventy-five years of age.

Many young or middle-aged patients with this condition can be made quite comfortable with pessaries, but when the menopause is reached, progressive atrophy of muscle occurs and these patients, who up to now have been fairly comfortable, gradually find that they require larger and larger pessaries, and that finally a stage is reached when no instrument will make them comfortable, consequently we are called upon to operate upon a large number of patients over sixty and even over seventy, and one of my colleagues has operated upon a patient of eighty-five years of age.

In some centers an interposition operation is advised, in others it is thought necessary to open the abdomen and fix the uterus to the abdominal wall. In our experience this operation of colporrhaphy does equally well after the menopause as in other stages of life, and we make no difference in the type of operation employed, whatever may be the age of the patient.

In this series there were 171 patients over fifty years of age with the following results: cured, 167, 97.72 per cent, and not cured, 4, 2.3 per cent. Even these four recurrences are very slight, the patients are all very much better and in no instance is the trouble sufficient to warrant the patient having any further operation. In three instances there is only a little laxity of the posterior fornix, and in the fourth a slight degree of cystocele, with a slight return of the incontinence of urine on straining.

In these series there were 5 patients aged respectively 70, 70, 71, 73, and 75 years, all of whom were cured. One of these at seventy-three years of age reports that she does all her own work, and can walk for miles.

Prolapse in Nulliparas.—The commonest cause of prolapse is weakness of the pelvic floor, produced by stretching and tearing during parturition, but a small percentage of cases occur in women who have not had any children, many of whom are virgins.

In these cases, there is a developmental weakness of the pelvic muscles, and in addition the patient has usually undertaken heavy work which necessitates increased intraabdominal pressure and so the uterus is driven down. This accounts for the fact that we see this type of case not infrequently in the industrial North, whereas it is extremely rare in the South of England.

It might be expected that this type of case would give a worse result, as the primary cause is a weakness or deficiency of the pelvic musculature, whereas in the parous patients the musculature was presumably normal in the first instance but damaged during parturition, and as the benefit of a colporrhaphy depends upon the

rebuilding of the musculature, there must be some cases in nulliparas where it is impossible to find a sufficient amount of this structure to hold the pelvic organs in position.

In this series I obtained replies from 32 nulliparas, of whom 31 were completely cured, while only one showed any sign of recurrence, but in one of the cases so little musculature was found in the pelvic floor that a ventral fixation was done in addition to the colporrhaphy.

Two of these patients were virgins of only sixteen years of age, and three were virgins sixty-three years of age.

One virgin, now over sixty years of age, reports that she is a weaver and does a full day's work looking after three looms.

I have not tabulated these figures or reduced them to percentages, as they are too small, but they do confirm our belief that the best treatment for these cases is our usual operation of a double colporrhaphy with amputation of the cervix.

Ventral Fixation.—Some operators have so little trust in vaginal repair that they always combine this with some form of abdominal uterine fixation.

With a properly performed colporrhaphy in a patient with a reasonable amount of pelvic muscle, this is never necessary. Very occasionally a case is found in which there is so little pelvic muscle that it is unlikely that the colporrhaphy can build up sufficient of this tissue to hold the organs in place, and consequently there is an odd case in which an abdominal section is done in addition to the colporrhaphy.

In this series there were two such cases, in one so little muscular tissue was found at the time of the operation that a ventral fixation was done at the primary operation. The other was a very interesting case, and was an instance of that rare type where the tissues either heal so badly or are so weak that they give way with very little strain.

This patient had a colporrhaphy performed on three separate occasions, followed in each instance with recurrence. On the fourth occasion I did a colporrhaphy and also a ventral fixation. A few weeks ago she reported to me that again something was coming down in the passage. I found the anterior colporrhaphy quite sound, no sign of prolapse of the cervix even when she strained and coughed, but in the upper part of the vagina was a piece of tissue extending down to the vulva over the top of the posterior colporrhaphy, and this at first I took to be a stretched portion of the posterior fornix. When I operated upon her a few days later I found that it was a true hernia from the pouch of Douglas through the vaginal scar and consisted of a sac of vaginal tissue lined by peritoneum, containing a large appendix epiploica. I tried to close this in the usual way, but found very little vaginal muscle, and I am doubtful if there will not be some recurrence. Her abdominal scar had also given way, and was riddled with small incisional hernias.

Lax Posterior Vaginal Wall.—It is very difficult to tighten this part of the vagina without running some risk of leaving the vagina too narrow, and in a large number of patients who complain of some symptom after the operation it is found that the laxity is located entirely in this region, which allows a portion of the posterior fornix to fall down like a foolscap over the lower portion of the posterior colporrhaphy.

In the majority of these cases the patient is merely conscious of there being a little tissue in the vagina when she strains, and the symptoms are so slight that she does not desire any further operation, but occasionally it is sufficiently marked to warrant removal of this redundant tissue.

In this last series I investigated (1927, 1928, 1929) 9 patients are recorded as not being satisfactory. Of these one had a small cystocele, another a definite hernia through the posterior colporrhaphy scar, and the remaining 7 were all cases

of lax posterior fornix, and only one of these was sufficiently severe to warrant any further operation. In the first series there was only one failure due to this cause, and this suggests that in the last few years I have failed, quite unconsciously, to carry my posterior colporrhaphy as high as formerly.

In order to avoid this complication, I now carry my posterior colporrhaphy higher, almost to the cervix, and I am hoping that by this method and especially by suturing the deep muscles at a higher level, I shall avoid this complication in the future.

Postoperative Treatment and Complications.—These patients do best in institutions where the Staff commonly nurses this type of case, owing in a large measure to their training to leave well alone.

The perineum should be kept as dry as possible and after each action of the bladder and the bowels it should be swabbed with a small quantity of lotion, dried with spirit and recovered with a sterile pad.

At the end of the operation, I pack the vagina with gauze soaked in B.I.P. (a bismuth, iodoform, and paraffin mixture) as this prevents the gauze from adhering and damaging the vaginal mucosa, and this gauze is removed the following morning. On the fifth day a vaginal douche of boracic lotion is given through a glass catheter to wash away any blood clot which may have accumulated in the vagina. The bowels are moved on the third day with some aperient which will produce a soft fluid motion, the one I prefer being liquid paraffin with cascara.

Retention of Urine.—The majority of patients find it impossible to empty the bladder while the gauze is in the vagina, and so it is often necessary to pass a catheter on the night of the operation. The following morning when the gauze is removed, the patient is encouraged to pass urine herself, but in a few cases this is still impossible, and a catheter has to be used for another day or two, although every endeavor is made to encourage the patient to perform this act herself.

Even with the greatest care, there is considerable risk of infection of the bladder whenever a catheter is passed, and this is especially so after this operation, as the bladder has been handled and displaced and some of its blood supply damaged during the operation. If this does occur, the condition usually yields to the ordinary medicinal treatment, but in a small number of cases a chronic cystitis is established, and therefore not only should great care be exercised when a catheter is used, but any symptoms of cystitis should be treated at once and continued until all trace of infection has disappeared.

Hemorrhage About One Week After the Operation.—This is the greatest trouble we have to contend with, but fortunately with due care cases of serious moment are very rare.

In the majority of cases, the hemorrhage comes from the cervix, and it is due I think to a low degree of sepsis which has prevented the healing of this tissue, and so when the catgut sutures give way the cervical incision gapes and bleeds.

Very rarely the hemorrhage comes from some other portion of the incision in the vaginal walls, and I remember one case in which a vessel on the anterior wall about an inch from the urethra caused severe hemorrhage on three occasions in the same patient, and had to be ligated three times in a period of three weeks.

It is very rare for hemorrhage to commence suddenly; much more frequently there is a little bright red stain on the pad and this should act as a warning. A mild antiseptic douche should then be given to wash away any septic discharge in the vagina, and an Iodex pessary inserted, and this treatment should be repeated for three or four consecutive days. In the great majority of cases this is the only treatment which will be required. If the hemorrhage is more severe, a piece of gauze soaked in B.I.P. should be packed into the vagina. Very rarely is

it necessary to give an anesthetic and restitch the incisions, and I can remember only four occasions on which I found this necessary in my private work.

I believe the trouble often originates in a small blood clot formed from cervical oozing which becomes infected in the vagina and lying in contact with the cervix infects the cervical incision. To obviate this, I have recently returned to Professor Donald's old treatment of giving a mild antiseptic douche on the fifth day.

Occlusion of the Cervix.—When Fothergill first suggested circular amputation of the cervix, it was argued against in that there would frequently be so much scar tissue produced that the cervical canal would be occluded. Provided that the cervix is well dilated, this very rarely occurs. I have used this particular method of amputation for many years, and only on one occasion have I encountered this complication.

In this case, the occlusion was definitely due to slight adhesions in the canal, and the result of treatment was dramatic. At four-monthly intervals the patient had severe abdominal pain with complete amenorrhea. On the fourth occasion I was called out to see her, with strict antiseptic precautions I used a uterine sound. My intention was merely to decide whether the external os was occluded, but the adhesions were so soft that they presented no resistance to the sound, which slipped into the dilated uterus: this was followed by a rush of blood which soaked the bed and part of my garments and for a moment I feared that I had opened some important blood vessel.

Vaginal Adhesions.—As the incisions in the anterior and posterior vaginal walls lie in apposition, it might be expected that adhesions between these would be a common occurrence. It is, however, only in a very small percentage of cases that this does occur, and the only trouble is dyspareunia.

At one period I had a number of cases with troublesome adhesions, due I think to the fact that at this period I left in the vagina a large swab soaked in spirit, while I resterilized my hands. Apparently the vaginal tissue was damaged by the contact with the spirit for these few minutes, as since I discontinued this method I have rarely met this complication. If the patient is an elderly widow, I do not touch these adhesions, and if she is married it is usually possible to stretch them digitally, though occasionally it is necessary to give an anesthetic to cut and ligate these adhesions.

Vagina Tightened Too Much.—In former days this was a common complication, but we now find that we can keep the uterus in quite good position without narrowing the vagina so much as was formerly done.

How far the vagina should be narrowed differs in each case, and the correct amount can only be judged after much experience, but even with the greatest care this complication will occasionally occur.

In this series were two patients who complained that the vagina was too narrow, but the difficulty was easily rectified by digital dilatation under an anesthetic, and without any incision into the tissues.

Ulcerated Cervix.—This is a common accompaniment of a complete procidentia, and is due partly to friction of the thighs or clothing, partly to obstruction of the venous return, and partly to infection. If a patient is operated upon while this ulceration is present, there is a very great risk that the site of the operation will be infected, and the wound break down, and I have seen death from general infection follow in one case, while in another the patient was in hospital for a year with pyemia.

I now make it a rule never to operate upon a patient while there is any ulceration, especially as these ulcers will so readily heal. The patient should be kept in bed, the cervix replaced whenever it comes down, and the vagina douched each day, once with boracic lotion and once with alum. If this treatment is carried

out, even the largest ulcer will heal in less than three weeks, and the operation of colporrhaphy can then be performed without any risk of infection.

SUMMARY

1. A combination of anterior and posterior colporrhaphy with amputation of the cervix is the best method of treatment for all cases of prolapsus uteri.
2. This operation is the best for all patients with this condition whether young or old, parous or nulliparous.
3. In this series of 549 cases, 529 (95.35 per cent) were cured.
4. This operation is not a cause of trouble in subsequent labors.
5. The prolapse may recur after subsequent labors but in less than 25 per cent of cases.
6. It is necessary to combine an abdominal operation with the colporrhaphy only in those very rare cases where practically no muscular tissue is found in the pelvic floor. In this series it was used only upon two.

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20 ST. JOHN STREET

PREVENTION OF CANCER OF THE CERVIX UTERI*

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AS GYNECOLOGISTS, we are confronted with a most serious problem. The rapid advance in the percentage of cures in cancer of the cervix has slowed down almost to a standstill. The splendid work of the last few decades enables us to save about one-fifth of the patients, but further marked advance seems blocked.

Since the beginning of the study of pelvic diseases, the recognition and treatment of cancer of the uterus has occupied a major place. The diagnosis slowly advanced from the recognition of late conditions by clinical symptoms to the recognition of earlier stages by microscopic examination of suspicious tissue. The treatment has advanced from absolute ineffectiveness to the saving of 20 to 25 per cent of the patients, when the best methods are employed.

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This great improvement in the effectiveness of treatment, which represents the saving of thousands of lives annually in this country alone, was not secured quickly nor easily. It came as a hard won victory in one of the great battles in human history. There was no spectacular array of armies and forts and trenches and guns and observation balloons and winged raiders of the air, to call attention to the serious activities in progress. Nevertheless, there was a devoted army of workers with units in every civilized nation, who battled silently day and night, year in and year out, against this most insidious and relentless foe of humanity. The problem of the cure of this form of cancer was attacked from every conceivable angle. All over the world workers and institutions and special organizations labored incessantly to solve it.

The result to date is, as before stated, an advance from the losing of all patients to the saving of 20 to 25 per cent when really effective methods of treatment are employed. But here the rapid progress stops. All the wonderful cancer-research institutions with their splendid laboratories and trained workers, and all clinicians with the latest hospital and therapeutic facilities, seem unable to add materially to this average percentage of cures. Large series of late statistics from various countries, evaluated on a common basis, give practically the same result. Improvements in technic of treatment have given some increase in cures, but the increase is so slight compared to the former rapid advance, that it indicates some serious and baffling obstruction in the path of progress.

The recognition of this fact should not discourage us in the fight against this form of cancer. It should stimulate us to greater efforts, to a more careful analysis of all the factors with which we have to deal, and to a more systematic and determined attack on the apparently insurmountable obstacle which blocks advance. As the old song puts it, "Let courage rise with danger, and strength to strength oppose."

What are the elements of the present situation that may have a bearing on the blocking of progress? In the first place, careful scrutiny of the progress made brings an interesting revelation. While 20 to 25 per cent represents the average proportion of cures of all patients under effective treatment, we find that in a certain class of patients the percentage of cures runs to 80 and 90 per cent, and occasionally even to 100 per cent. The very high percentage of cures in this class of patients shows that our present methods of treatment are sufficient to eradicate the disease in nearly every case of this class.

Looking again at the statistics we find that there is another class of patients in which the percentage of cures remains around 20 per cent and below. The percentage varies somewhat in different large

series, but in a general way that seems about the limit of cures in this class, even with the most careful and vigorous use of all our present resources.

What is the decisive element in the extremely favorable class, in which the cancer can be cured almost with certainty? What is the decisive element in the very unfavorable class, in which four out of five individuals are doomed to death? Is the decisive element a race factor or the condition of the general health or some peculiar individual resistance? It is none of these abstruse conditions, but something easily understood and readily recognized, namely, the duration of the cancerous process. If found in the beginning, it can be cured almost certainly. If not found until late, the cure is problematical with a very large proportion of failures inevitable.

If 95 per cent of cases of beginning cancer can be cured and 20 per cent of advanced cases, why does the average percentage of cures hover around 20 per cent? Why does it not average up to 60 and 70 per cent, as might reasonably be expected with all the strenuous efforts made to get the cases early? The reason is that very few cases of cancer of the cervix are seen in the early stage. This fact is clear from the aggregate statistics from all countries. It is strikingly illustrated in our own statistics at the Barnes Hospital of the Washington University Medical School. In the analysis¹ of our five-year results in cancer of the cervix, from 1921 to 1926, 121 patients with this disease were treated. Of the 121 cases only 3 were in an early stage—all the others showing extensive infiltration of the parametrium, most of them out to the pelvic wall. As it happened, all three of the early cases recovered, giving 100 per cent of cures in this class. But the great preponderance of advanced cases over early ones (118 to 3) brought the average of cures down to 22 per cent.

It is perfectly clear then that getting the cancer of the cervix in an early stage is the decisive factor in raising the percentage of cures. Does that solve the problem? One may think so, feeling that the 90 to 100 per cent efficacy in early cases of present treatment-methods, removes the major difficulty in preventing deaths from cancer of the cervix. But I am sorry to say that it does not. Early diagnosis of cancer of the cervix sounds easy, but how can one make an early diagnosis when the patient does not come until a late stage? That states the serious difficulty in a nutshell.

This is not a new discovery. It is an old, old story. For generations the profession has struggled with the problem of getting these cancers early. There has been no lack of recognition of the importance of early diagnosis, and no lack of strenuous and widespread and well-directed efforts to that end. The importance of early diagnosis has been emphasized continuously by leaders in clinical work and in

medical education—through textbooks and medical journals and local, state, national, and international medical societies. Special organizations have taken up the task and disseminated most helpful information to the public through newspapers and periodicals and special publications. Special days have been set aside to arouse interest and promulgate information that would educate the public to the importance of seeking examination at the first suspicious disturbance.

All this has resulted in definite benefit. The early recognition and treatment of external cancers has been greatly advanced. The same may be said of the internal cancers that produce early symptoms, many patients seeking advice for the early symptoms who otherwise would have dismissed them as of no serious import. This applies to cancer of the corpus uteri, which usually causes early bleeding. It has also helped to bring cancer-of-the-cervix patients for advice somewhat earlier, the shift being from the very late toward the middle stage. But even this middle stage represents a wide extension of the cancerous process in the parametrium and to the pelvic wall.

Why is it that intelligent persons with cancer of the cervix seek advice in the middle stage of the disease instead of coming in the early stage? Why is it that, in spite of the widespread dissemination of information through both professional and popular channels, the great majority of these patients do not come to any physician until the disease is already extensive?

It is because of a fact, which we have been slow to acknowledge but which is becoming more and more evident with increasing information, namely, that cancer of the cervix does not cause any symptoms in the beginning. As far as this form of cancer is concerned, the so-called "early" symptoms are early only in the symptomatic sense. They are the first symptoms noticed by the patient, but they do not represent the early stage of the pathologic process. The microscopic change that constitutes the beginning of cancer does not cause bleeding nor discharge. At first there is nothing to suggest cancer to the patient nor to the physician. The really early stage of the disease causes no symptoms whatever. By the time the so-called "early symptoms of cancer" appear, the cancer has already been present a considerable period and has developed extensive, though hidden, prolongations.

It is this discouraging but well-established fact that makes the outlook for further marked advance in treatment-results so hopeless, when viewed from the ordinary early-diagnosis-treatment standpoint. The great campaign for early diagnosis and treatment has largely failed because there are no symptoms in the really early stage. Consequently, the profession is confronted with an apparently insurmountable obstacle to further advance in this direction.

This situation is somewhat analogous to that trying situation which developed in the early days of the operative treatment of cervix cancer. It contains the same elements of enthusiastic attack on a serious problem, of high endeavor to save patients from a fatal disease, of seeming success, and then of subsequent gradual disheartening realization of failure. The parallelism goes even further, for in that situation as in this the cause of the failure was an overlooked pathologic condition, and when that pathologic condition was recognized, the obstacle it placed to further advance seemed insurmountable with the facilities then available. I quote from a recent article² containing a brief summary of that former situation.

"Some forty years ago the treatment of cancer of the cervix was just emerging from the stage of mistaken hope in the effectiveness of ordinary hysterectomy. A few years previously the brilliant success of surgery in other gynecologic conditions had raised high hopes for the cure of this dread disease by the removal of the affected organ. Vaginal or abdominal hysterectomy was the accepted treatment. Large series of patients had been subjected to this supposed radical treatment, with excellent immediate results. But the lapse of time had brought revelations that were disconcerting. The large number of hysterectomized patients, who had done so well at first, gradually disappeared by death from recurrence of the cancer. Year by year the mounting number of deaths in the early series raised ominous forebodings. Slowly but surely, in spite of reluctance to accept it and stubborn fighting against it, there came finally the realization that hysterectomy as then carried out was not a cure for cancer of the cervix. In one large series of operations not a single patient survived five years. In other series there was only an occasional survival. The high hopes built on early results had been completely overthrown, and the profession was back where it started, with no cure for this disease.

"However, this harrowing experience was not without beneficial results. It had been demonstrated definitely that there was some unknown factor in the situation or some known factor that required much more serious study. In the attempts to determine the causes of failure of ordinary hysterectomy as a cure for cancer of the cervix, there developed one of the most brilliant and useful pieces of pathologic work in the history of medicine.

"The clear demonstration of minute nonpalpable cancer-prolongations beyond the palpable involvement of the cervix and parametrium, showed why ordinary hysterectomy did not cure the cancer. Whether the prolongations were by continuity of cell-growth or by metastatic transportation of cancer cells to outlying glands, the result was the same, namely, recurrence.

"The problem then became clear. Some means must be found to destroy these outlying cancer cells, which were evidently present in practically every case when the patient came under observation."

Such destruction of outlying cancer cells was impossible with the methods then in use. Did gynecologists drop this seemingly impossible task? Not at all, but on the contrary they attacked the problem with such energy and quiet determination and inexhaustible patience, that the treatment of cancer of the cervix advanced from complete failure to the saving of 20 to 25 per cent of the patients treated.

The advance has now slowed almost to a standstill, because of another obstacle, namely, the absence of symptoms in the really early stage, and the consequent impossibility of the subjective recognition of beginning cancer. Though the splendid campaign of education previously referred to has resulted in bringing these patients somewhat earlier than before, it has not resulted in bringing them in the beginning, because there are no symptoms in the beginning.

The growing appreciation of the importance of the fact that we are not getting these cancers early in spite of all efforts to do so, has resulted in a careful and anxious reexamination of the whole situation as it relates to cancer of the cervix. There is much discussion of what constitutes the earliest cancer changes, and how they may be recognized in the microscopic examination of excised tissue. New methods of clinical recognition, such as ocular magnification in the vagina and chemical reaction, are being tested for discerning beginning cancer changes in the epithelium of the cervix. All these steps for detecting the earliest cancer changes are important and are to be encouraged. But far more radical measures than these are necessary to produce any marked advance in the prevention of deaths from this disease. It is necessary to attack this serious problem in some other way than by explaining cancer signs and symptoms to physicians and patients. We must go back of the whole cancer picture, and remove the conditions which precede the cancer and cause it.

It is well established that cancer of the cervix comes from long-continued irritation in the form of chronic cervicitis, usually accompanied with laceration, eversion, infiltration, and cystic change. As I have said many times, these lesions are very obvious and their rôle in cancer origin is generally known, and yet they are allowed to go on and on well into the cancer age. Great pains are taken in cases of chronic cervicitis to detect the first signs of cancer so that treatment for cancer may be promptly instituted, whereas a far safer plan is to remove the chronic cervicitis promptly before it becomes cancer.

Chronic cervicitis may be cured by simple excision of the affected area of the cervix, and thus cancer prevented. But when cancer has once begun in the irritated area, cure is uncertain even by the most radical measures.

It is clear then that an important step in preventing deaths from cancer of the cervix is the systematic and early removal of those chronic irritative lesions of the cervix which precede cancer. Not only is this an important step, but it seems the only step by which to secure further marked reduction in deaths from this disease.

The importance of removing chronic irritative lesions in the cervix has long been recognized and emphasized by leaders in gynecology. My hope is to supplement these sporadic warnings with a systematized

plan of action which will deal effectively with this serious situation. All that I have said before is only preliminary to this main theme—an introduction to make clear the serious situation and show the compelling importance of putting into practice some really effective procedure.

In formulating such a plan the following three facts must be taken into consideration:

1. Thousands of patients are receiving palliative treatment for chronic irritative lesions in the cervix, such as cervicitis, "ulceration" of cervix, laceration, eversion, erosion, and polypi. The palliative measures keep the patients fairly comfortable, but they do not remove the deep chronic irritation which favors the development of cancer.

2. Other thousands of women are treating themselves for a "little leucorrhea" in ways that may keep them comfortable but do not stop the process of cancer development in the irritated cervix.

3. There are other women in which the chronic irritation in the cervix does not give rise to any symptoms that would cause the woman to suspect local trouble.

In the attempt to eliminate these chronic irritative lesions, which eventuate in a large number of deaths from cancer of the cervix, means must be found for reaching the above-mentioned three classes of persons. Effective work in this direction requires energetic action along two important lines as follows:

1. Work by individual physicians with their patients, to the end that chronic irritation in the cervix be removed before it eventuates in cancer.

2. Extension of present excellent educational work to include measures for making clear to the public the fact that cancer of the cervix develops without any warning signal, hence the importance of local examination, that any existing irritation of the cervix may be eliminated before cancer develops.

The above twofold plan takes care of the problem theoretically, but we cannot be satisfied with theory and principles only. This is such a serious matter that details must be carefully worked out and tested and every possible means devised and activity employed to secure results. The issue of life or death is being decided daily for many persons. While we are considering the subject, some of our own patients—even members of our own family—may be crossing the line between inflammation and cancer. The working out of the principles of a plan is only a part, and the smaller part, of the solution of this great problem. A systematic and comprehensive plan of campaign is quite necessary in a war, but no plan can win a war. The war is won by the application of the plan to the securing of results—the success-

ful meeting of the opposition, the prompt adaptation to unforeseen developments, and the actual attainment of the important objectives. These hard facts apply likewise in this war on disease.

Each of the two large divisions in the twofold plan mentioned has subdivisions which require careful and extended consideration in order to secure practical action and the attainment of definite results. At this time principal consideration will be given to the work of the individual physician with his patients.

WORK OF PHYSICIAN WITH HIS PATIENTS

The physician is the leader and mainstay in this serious campaign. Each physician has it in his power to aid materially in the general reduction of deaths from cancer of the cervix and in saving his individual patients from this fatal disease. This is a wonderful opportunity for important constructive work by every physician. Cancer is such an extensive subject, with such deep and abstruse problems baffling the talent and facilities of great institutions, that we are inclined to think that important work in connection with it must be entirely the privilege of those with special training and special facilities. But here is an opportunity for every physician to give definite aid in the great fight which is going on all over the world to lessen the number of deaths from cancer of the uterus. No matter where the physician is located nor how limited his facilities, he has it in his power to take an important part in this great work.

The details of effective work by the physician in this direction include the following:

1. In the handling of patients with inflammation or irritation of the cervix, chronic irritation must not be allowed to persist. This applies especially to patients past thirty-five, though cancer occurs also before that age. Having eliminated acute irritation by douches and local treatment, any remaining chronic irritation should be removed by excision or other radical measure. I do not care at this time to take up the pros and cons regarding the different methods of treating these minor lesions of the cervix; suffice it to say that the treatment should eliminate the chronic irritative lesion. Temporizing palliative treatments do not remove the danger.

It is important to remember that a certain proportion of cancers of the cervix (in some series as high as 10 per cent) occur before the age of thirty-five. This means that the old idea of postponing repair of the cervix to the end of the childbearing period is not safe. We know that chronic irritation in the cervix may result in cancer in younger women. Several cases of patients under the age of thirty have been reported. Consequently it is dangerous to allow irritation in the cervix to persist even in the childbearing period.

The only safe plan is to eliminate the area of chronic irritation. Carried out circumspectly with care to avoid undue sacrifice of normal tissue and unnecessary scar formation, it should aid rather than interfere with subsequent childbearing. Even though there should be some laceration with a subsequent labor, repair of this is a minor matter compared to risking cancer development.

2. Patients in whom cervical irritation has cleared under treatment, should be watched by occasional check-up examination to see if the irritation returns.

3. Patients who come for other conditions, should be asked about leucorrhea and other evidence of pelvic disturbance, that the required examination and treatment may be carried out.

4. Patients who come for other conditions and have no pelvic symptoms, present one of the difficult problems in this cancer prevention. We know that even without subjective symptoms there may be sufficient chronic irritation in the cervix to favor aberrant cell-activity resulting in cancer. On the other hand, a practicable rule of action must take into consideration the patient's natural reluctance to examination not indicated by symptoms.

Here is where the leadership of the physician comes in. By tactful instruction, that causes no undue apprehension, the patient may be made to realize the advisability of a local examination as part of the general examination on which his responsible advice to her is to be based. The age at which such local examination is required in patients without pelvic symptoms will vary somewhat with the history and circumstances, but in general it is advisable by age thirty-five or earlier.

From the physician's standpoint, this local investigation as part of the general examination is imperative. His responsibility as the patient's medical adviser makes it necessary for him to know definitely whether or not there is beginning cancer of the cervix or chronic irritation there that may lead to cancer. The internist, the general practitioner—every physician who assumes the responsibility of advising a patient in regard to her general health—must keep in mind the possibility of symptomless chronic irritation in the cervix that may eventuate in cancer.

5. How often should the local examination be repeated? The patient will sometimes ask this question. And the physician should have decided it for himself in preparation for advising the patient, whether or not she asks it.

It is important to work out a practicable plan. The local examination should be made often enough to reasonably exclude irritation that would favor cancer development. At the same time the interval should be as long as is safe, in order to avoid unnecessary trouble and expense to the patient. Also, the choice of interval should be such as to appear reasonable to most patients when the matter is explained to them. The choice of a rather long interval which appears to the patient so reasonable that she returns regularly, will go much farther toward preventing cancer than the choice of an interval so short that the patient neglects it and finally gives up regular examinations. Considering the various angles of the matter, it seems to me that a reexamination once a year from age thirty-five to fifty-five, is a reasonable rule to incorporate in our advice to these patients.

The probability of the patient's cooperation in the idea of a regular yearly examination may be enhanced by pointing out that this twenty-year period is one of change in body structure and function, and that many authorities are recommending yearly general examination as a safety measure to determine how the various vital organs are standing the wear and tear of life's activities. This reinforces and emphasizes the idea of regular general examinations, of which the local examination is a part.

In the years before thirty-five and after fifty-five, occasional examinations are desirable, but for the present it seems best to concentrate on the twenty years mentioned, and to use our energy and educational facilities to drive home the importance of regular yearly examination during that crucial period.

It is necessary to give the public reliable information on this subject for two reasons: first, to supply to those persons who do not consult a physician the information they would not otherwise obtain and, second, to emphasize to patients the importance of following the advice on this subject given by their physicians.

An important part of the instruction of the public in this matter will come indirectly from the individual physician, through the general contacts and conversation of his patients to whom he has given advice.

The other important means of public instruction include the local and state and national medical societies and those special organizations of mixed professional and lay membership which have been so helpful in disseminating reliable information on health matters. The American Society for the Control of Cancer has done splendid work in educating the public to an appreciation of cancer symptoms and the importance of seeking prompt relief. To it naturally falls the leadership in this additional step for preventing deaths from cancer, namely, instruction of the public as to the necessity of regular periodic examinations for the discovery and removal of chronic irritative lesions that precede cancer. Considerable work has already been done along this line, but much more remains to be done in regard to cancer of the cervix.

My allotted time has been devoted to the first half of the twofold plan, namely, the work of the physician with his patients. The second half, i.e., effective instruction of the public in the prevention of this form of cancer, can only be mentioned here. But it is of great importance and calls for the same careful detailed study and planning, and vigorous execution urged under the work of the individual physician.

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UNIVERSITY CLUB BUILDING.

THE OCCIPITOPOSTERIOR POSITION*

A METHOD OF MANAGEMENT, WITH AN ANALYSIS OF 976 CASES

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THE continued high fetal mortality, maternal injury, and morbidity in the delivery of the occipitoposterior position is, I believe, sufficient justification for this communication.

Many indeed, have been the methods advocated for the management, more particularly of the so-called impacted cases; but their effect in the reduction of fetal mortality, maternal injury, and morbidity have been disappointing.

The frequency of any obstetric abnormality will always vary in different countries and even in different parts of the same country.

The posterior occiput is no exception; various authorities show an incidence as high as 29.8 per cent, and our own incidence is 13.8 per cent of vertex cases.

Discussion of the frequency is of little value, as it is conceded by all to be the most common obstetric anomaly and is responsible for a high fetal wastage and greater maternal injury than almost any other condition.

In the analysis of 976 cases of occipitoposterior position during a period of six years, observed at the Royal Victoria Hospital, primiparas and multiparas show an almost equal ratio (513 to 463).

The right occipitoposterior was almost twice as frequent as the left (619 to 357), but by no means in the proportion that is usually quoted (Williams 5 to 1).

The large number of normal pelvis (864) and conversely the small number of pelvic contractions (112, or 11.6 per cent) as determined by the usual methods of pelvimetry, were quite unexpected. While of the pelvic contractions the flat pelvis was almost twice as frequent as the funnel, the actual number is too limited to draw any definite conclusions.

Besides, although all types of pelvic contractions are usually quoted as an etiologic factor in the production of posterior positions, external pelvimetry alone, or combined with internal estimation, frequently does not, and cannot reveal the true type. Even the x-ray examination of the parturient pelvis has not altogether proved of the help that was hoped from it.

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Although the work of Thoms on x-ray pelvimetry, and more recently that of Caldwell and Malloy on male stigmas, point out certain important facts which may possibly explain the frequency of posterior positions of the occiput and even their cause, nevertheless, both of these authorities show a somewhat different type of pelvis: the former, the transversely contracted (quoting 20 cases), and the latter, the funnel or masculine type. Thoms states that a high assimilation is of frequent occurrence, and associated with it there is a shortening of the transverse diameter. With this view, many authorities are in accord.

Fabre and Trillat (in 1920) from x-rays of 12 pelves, all of which showed sacralization of the fifth lumbar vertebra, coined the term, pelvis with anteroposterior diameter predominating, or, in other words, a high assimilation. Seven of these were delivered as occipitoposteriors.

They state that "this has the relation of cause and effect, and this special form of superior strait is the principal cause of occipitoposterior." Thoms says that "not only are such pelves associated with occipitoposterior, but lesser degrees of transverse contraction, whether due to assimilation, male type of pelvis, or unnamed causes, are definitely associated with primary and persistent occipitoposterior." He concludes that the shape and type of pelvis is the most potent cause of primary occipitoposterior position. Caldwell states that "male stigmas in the female pelvis tend to limit pelvic capacity. This is manifested in the type of sacrosciatic notch." There is a definite relation between type of notch and internal diameter of the true pelvis.

"Variations in the size and shape of the notch are associated with a change in sacral inclination and so diminution of pelvic capacity. Given a normal notch, all internal diameters are decreased." This limitation of pelvic capacity is prone to occur in the portion of the pelvis posterior to the ischial spines.

"With the male type of notch, the sacrum moves forward in the pelvis, decreasing the length of the sacrospinous and sacrotuberous ligaments. [That is, the distance between the sacrum and tuberosities and ischial spines.] This decrease means taut, unresistant tissues, increasing the difficulties in labor, rotation may fail to occur or posterior positions more frequent with fixation of the head, or arrest in this unfavorable position."

While accepting the work of both of these authorities as of great importance, and admitting that on certain clinical grounds the weight of evidence is in favor of both views, as both types of pelves are frequently associated with posterior positions, how may one explain the fact that in many occipitoposterior positions in which the head has not entered the pelvis, or cannot enter with the occiput behind, a change to the anterior position allows of easy descent? It is not a question of disproportion necessarily, for that is most frequently only apparent. Convert the posterior occiput to an anterior one and its entrance into the pelvis readily occurs. If the pelvis was the only factor in the causation, alteration of the position of the occiput should not make such a decided, in fact often spectacular, difference to its descent. Again, it is not entirely the loss of flexion which prevents

descent, for in many instances, flexion is well preserved. May the true etiologic factor not lie in the uterus itself? With the placenta on the anterior wall, the child's back would more readily accommodate itself to the unoccupied posterior portion of the uterine cavity. This has frequently been proved by cesarean section. Again, with the development of the uterus from two müllerian tracts, one-half may develop to a greater extent than the other, thus allowing of accommodation of the fetus readily to the more developed side. A summary of maternal injury, morbidity, and fetal mortality throughout the whole series of 976 deliveries shows that as regards maternal results, the cervix suffered injury in 33 cases, 3.3 per cent, necessitating repair. It is necessary to state in regard to maternal injuries, that it is a rule of the clinic that after any operative procedure, the cervix must be exposed and any tear of half an inch or more sutured, an essential reason for the apparently high percentage of injuries. There were 71 complete tears. Among these cases of complete tears were included those in which the sphincter was torn partially, or completely through, whether involving the anal mucosa or not. This interpretation has been taken throughout the entire series, because experience has shown that occasionally even though the anus escaped injury, or the sphincter was only partially lacerated, the devitalization of tissue subjacent to the sphincter may have been such that necrosis occurs, with a subsequent sinus into the anus and infection in the perineum. True, these usually heal eventually without the necessity of a secondary repair, but from a practical point of view, they may as well have involved the anus. Maternal morbidity occurred in 249 cases or 24.4 per cent.

The standard of morbidity used was a single rise of temperature to 100.6° F., occurring during the puerperium after the first twenty-four hours. Fetal deaths were 44, or 4.5 per cent, and included stillborn and those that died during the first two weeks of life.

Monstrosities and macerated, as well as nonviable babies up to six and a half months have been excluded because their loss is in no way due to the position.

An analytical study of these cases of occipitoposterior position shows that failure of rotation is a primary factor in the causation of fetal mortality and maternal morbidity. Throughout the entire series of both spontaneous and operative delivery this fact is evident.

What then are the chief causes of failure of rotation and should such occur, what method can we adopt as conducive to the best results?

The common causes of failure of rotation are imperfect flexion, an inadequate uterine force, a poorly developed or relaxed pelvic floor, and the inability of the fetal trunk—the back and so the shoulders—to move forward toward the symphysis, for so long as the shoulders are prevented from rotating, so long must the rotation of the occiput fail.

This is a frequent cause of failure of rotation in attempts at either manual or forceps rotation of the occiput in the pelvis, inasmuch as, on the removal of the hand or forceps, the occiput immediately swings back to its original position.

The cause of failure of rotation of the shoulders is commonly found to be an internal contraction ring, situated around the child's neck, or just in front of the shoulders, and is the lower border of the active uterus. Our opinion regarding the situation and frequency of these rings is in conformity with the experience of Sidney Smith in the Brooklyn Hospital series.

It is evident that any method aiming at operative delivery which fails to take cognizance of this fact must necessarily meet with many difficulties, or even failures.

I therefore add my plea to those of the writers who have advocated early interference in occipitoposterior positions, because, at least two very frequent causes of failure of the head to advance, namely, imperfect flexion and the development of an internal contraction ring, will be eliminated or rendered less likely.

On the basis of the analysis of these cases as regards maternal and fetal results, I shall endeavor to describe the method which above all others, except spontaneous anterior rotation and birth, has proved in my hands and those of the members of the Staff to be productive of the best results.

PROCEDURE

It is our custom not to interfere during the first stage of labor, except by those therapeutic methods which aim at the relief of pain. After complete dilatation of the cervix, labor is allowed to progress naturally as long as the head is advancing rapidly. Failure of the head to advance demands immediate determination of the cause and its correction. It is usual in such cases to find the membranes ruptured, the sagittal suture of the child's head lying in one or other oblique with occiput behind, or in the transverse diameter of the pelvis. Flexion of the head is, as a rule, imperfect, the head being engaged in the pelvis. There may, or may not, be undue moulding, depending on the duration of the second stage. With the whole hand in the vagina, the perineum and pelvic floor are thoroughly dilated. The entire head is carefully palpated, if necessary, to make a correct diagnosis as to the position, the degree of moulding, and the type of head. The head is dislodged completely and pushed up above the pelvic brim. The hand is passed through the cervix beyond the occiput (Fig. 1). If any resistance is encountered, such as a contraction ring around the neck, it is carefully "ironed out." The anterior shoulder is palpated and its position determined. If the shoulder appears to be directed forward, it is ignored; if the child's back is found to be directed toward the maternal back, the shoulder is carried forward as far toward the antero-posterior diameter as possible. The head is now placed so that it lies with the sagittal suture in the transverse diameter of the brim, the posterior ear resting in the palm of the hand. The back of the hand will then be lying on the promontory of the sacrum. The posterior blade of the forceps is now applied along the palm and placed exactly over the posterior ear, with the pelvic curve toward the occiput (Fig. 2). The handle of the forceps is held by an assistant to prevent slipping

during the application of the second blade. The hand is then withdrawn, and the anterior blade is carefully passed across the face of the child until it lies over the anterior ear, i.e., directly opposite the first blade (Fig. 3). There can be no possible danger of injury to the bladder during this or any subsequent part of the procedure, because all manipulations are done above the brim of the pelvis where



Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.

there is plenty of room. The forceps is now locked. A gentle movement of 45° rotation is now imparted to the forceps, the object of this movement being to bring the occiput to an obliquely anterior position (Fig. 4). Every step in the maneuver up to the present time is done with the head free from pelvic control. The head is now lying within the forceps at the brim of the pelvis, the sagittal suture is in relationship with one of the oblique diameters, and the occiput is obliquely anterior (Fig. 5).

With traction, the head is once more brought down into the pelvis (Fig. 6). It is astonishing the ease with which the head descends on to the pelvic floor and delivery is accomplished.

Usually in this method, the head is brought down in the opposite oblique diameter to that which it originally occupied, i.e., the R. O. P. will be brought down after rotation as an R. O. A., the L. O. P. as an L. O. A. (the left hand being used in right position and vice versa).

Criticism of the method on the basis that completely dislodging the head from pelvic control increases the danger of prolapse of the cord, or hand, or, that a high forceps, or a forceps operation on the floating head is done, is exaggerated. Although admitted on theoretical grounds that the cord may prolapse, this complication did not occur in a single instance, for with the hand already controlling the head in the lower uterine segment, the cord could readily be kept from prolapsing dur-



Fig. 5.



Fig. 6.

ing the application of the blades. Even in the event of such an accident, it would not necessarily endanger fetal life to any great extent, subsequent delivery being accomplished in all cases with facility.

Again, before its displacement the head was engaged and had undergone moulding in the pelvis. To dislodge it entirely and bring it down once more into the pelvis in a corrected position is in no manner similar to the high application of forceps to a head that had never entered the pelvis.

The maneuver in our hands has proved absolutely safe and eminently successful. A reference to the fetal mortality throughout the entire series of cases is the best evidence of its value.

No other method of delivery has given us comparable results. The two fetal deaths occurring during this method of delivery represent the gross mortality. Both could have been avoided. One was a pri-

vate patient of my own, a primipara in whom there was a marked degree of disproportion due to a generally contracted pelvis and a large baby. Cesarean section was advised before the onset of labor and refused. The other death occurred as the result of a prolonged labor of eighty hours, and the baby had a failing heart.

RESULTS

In the 976 cases of occipitoposterior positions spontaneous birth occurred in 392 or 40.1 per cent. Among these spontaneous deliveries, anterior rotation and birth occurred in 284 or 72.4 per cent; all the pelvis were normal as regards pelvimetry. There were no cervical injuries, but in spontaneous birth, the cervix is not exposed unless bleeding occurs. There were no complete tears. The morbidity was 18.6 per cent. There were no maternal deaths, but a fetal loss of 2 or 0.7 per cent, both of which were due to intracranial injury, hemorrhage, and tentorial tears. The remaining spontaneous births, 108 or 27.6 per cent, remained persistently posterior and were born as "face to pubes." These showed a marked increase in both fetal mortality and maternal morbidity, the latter being 33 or 30.5 per cent. The fetal mortality was 6 or 5.5 per cent.

An analysis of these spontaneous births shows that the maternal morbidity and the fetal mortality rises in proportion to the failure of anterior rotation, even though labor may progress fairly satisfactorily and natural birth occur.

It is a moot question whether the higher fetal death rate in the "face to pubes" is due to prolongation of labor, or to other factors, such as imperfect flexion, or to those causes which prevent anterior rotation, such as excessive moulding and distortion of the head with a large caput, for it is undoubtedly true that whenever anterior rotation fails labor is likely to be prolonged.

In addition, the same factors which prevent forward rotation of the occiput are probably responsible for the occiput turning backward into the hollow of the sacrum.

Undoubtedly, the cause of fetal death resultant upon labor is intracranial injury, as has been proved by Holland, Ehrenfest, and many others, as well as in our own experience. About 80 per cent of all fetal deaths in the clinic go to autopsy.

The total operative cases were 584 or 59.8 per cent of the whole series, primiparas 65 per cent, multiparas 37 per cent. The right position was more frequent than the left in about the same proportion as the parity.

Pelvic contractions played an apparently large factor, occurring in 102 cases or 17.4 per cent, with the funnel type constituting the minority. Nevertheless, many of the generally contracted variety were also of the funnel type.

The number of maternal injuries, cervical and complete tears, commands attention, being 33 or 5.6 per cent of the former and 68 or 11.6 per cent of the latter.

In 157 low forceps operations there were no cervical tears, but 12 complete tears, 6 of which occurred in "face to pubes" birth, or expressed in another way, 45 low forceps operations delivering as "face to pubes," resulted in 6 complete tears. The definition of the term "complete tear" given at the beginning of this paper, explains to some extent the high incidence.

There were 37 morbid cases, or 23.5 per cent, 2 maternal deaths neither of which was due to the position or operation. One patient had placenta previa and died on the fourteenth day postpartum of sepsis; the child survived. The other patient with an eclampsia had a bag induction but died the second day postpartum; the child also died. Both of these were "face to pubes" births. There were four fetal deaths or 2.4 per cent.

The maternal morbidity in the operative series is 27.5 per cent, 163 cases in 584 deliveries. The apparently high morbidity is to be explained by the rigidity of the standard used and already defined, and because the great majority of these cases showed only a single rise of temperature to 100.6° F. Under any other standard, such as the British Medical Association, the morbidity would be below 10 per cent.

One might expect a higher morbidity rate in operative procedures than in spontaneous birth. In fact, the "higher up" in the generative tract one goes, the more likelihood of infection, is the usual dictum. Yet, this is not necessarily true, because of numerous other factors.

The low forceps operation was responsible for almost as high a morbidity (23.5 per cent) as any of the forceps methods. True, it is much greater than the spontaneous anterior rotation and birth, which was 18.6 per cent. Nevertheless, spontaneous "face to pubes" birth showed a morbidity of 30.5 per cent. The most likely reason for this is the natural tissue devitalization associated with an anomalous position, and the prolongation of labor which is usually present in the "face to pubes."

Operative procedures, therefore, within certain limitations should tend to diminish the morbidity risk rather than increase it.

In the classical midforceps operation there were 209 cases of which 168 had normal pelves and 41 contracted pelves, represented by an almost equal number of the three main types (flat, generally contracted, and funnel).

The cervix was injured 11 times, of which 7 occurred when the head was delivered in an anterior position and 4 in "face to pubes" delivery.

There were 39 complete tears or 18.6 per cent, of which 17 or 21.1 per cent occurred in "face to pubes" birth.

Maternal morbidity was 58 or 27.2 per cent, of which 22 or 30.9 per cent occurred in "face to pubes" birth and 36 or 26.0 per cent in anterior rotation and midforceps delivery.

There was 1 maternal death (0.4 per cent), a patient with acute exudative fibrinous endocarditis, who died on the fifth day; the child also died. Fetal deaths, 16, or 7.6 per cent.

The Scanzoni operation was done 67 times, contracted pelves being present in 15 of these cases.

There were 6 cervical tears or 8.9 per cent and 10 complete tears, 14.9 per cent.

Thus it is evident that in forceps procedure—the Scanzoni operation and the method already described—the morbidity was almost the same, being 25.3 per cent and 26.1 per cent respectively.

The classical midforceps operation after anterior rotation had occurred, showed a morbidity rate of 26.0 per cent; in fact, the three chief forceps operations gave equivalent morbidity percentages, while, if anterior rotation failed and delivery occurred as "face to pubes," the rate was 30.9 per cent. It is therefore obvious from this analysis that "face to pubes" birth, whether spontaneous or operative, increases the morbidity hazard remarkably.

The high forceps operation was responsible for a morbidity of 55.5 per cent and a fetal death rate of 11.1 per cent.

FETAL DEATHS

A comparison of the various operative methods in relation to fetal death reveals some striking results.

In the low forceps operation, there were 4 fetal deaths, i.e., 4 deaths in 157 cases, or a wastage of 2.48 per cent. In spontaneous anterior rotation and midforceps, there were 138 cases with 12 fetal deaths, or 8.6 per cent. Midforceps and "face

to pubes," 71 cases, with 4 fetal deaths, 5.6 per cent. The Scanzoni operation, or its modifications, 67 cases, with 5 fetal deaths, 7.46 per cent. The author's method, 107 cases with 2 fetal deaths, or 1.8 per cent. High forceps, 27 cases with 3 fetal deaths or 11.1 per cent. Version and extraction, 17 cases, with 6 fetal deaths or 35.7 per cent.

It is therefore evident that the gross operative fetal mortality is much higher than that in spontaneous birth as a whole, being 6.1 per cent in the former to 2.04 per cent in the latter, yet if anterior rotation failed and delivery occurred as "face to pubes," the fetal wastage is almost the same, 5.5 per cent (face to pubes).

This failure occurred in 27.5 per cent of the total spontaneous labors. Again, the proportion of spontaneous to operative birth is approximately 3 to 5. Failure of anterior rotation is therefore a primary factor in fetal wastage and accordingly demands prompt correction. The longer correction is delayed, the greater the fetal risk. In fact, there is a correlation between the duration of labor and the fetal death rate. The average duration of labor in the operative series terminating in fetal death, was fifty hours, whereas the average duration in successful results was thirty-one hours. The average duration in spontaneous labor with fetal death was twenty-three hours.

CONCLUSIONS

1. The apparently high incidence of maternal injuries is to a certain extent explainable: first, as regards the cervix, all tears whether large or small following operative delivery are repaired immediately, many such being of a very minor degree; second, the term "complete tear" is not confined to those in which the anal canal is involved, but includes all lacerations of the sphincter ani.

2. The morbidity rate is based on high standard: a single rise of temperature of 100.6° F. occurring at any time during the puerperium after the first twenty-four hours, from any cause whatsoever, without any attempt to eliminate those which were not strictly obstetrical.

3. The increased morbidity rate associated with the failure of anterior rotation whether labor was spontaneous or operative, is to be noted. In fact, "face to pubes" birth was responsible for a much higher morbidity than any other delivery, spontaneous "face to pubes" being 30.5 per cent.

4. The close similarity in the morbidity rate among all the forceps operations is instructive.

5. The best fetal results were obtained by the method especially described, being less than that in spontaneous birth as a whole.

6. Early interference in occipitoposterior positions is conducive to the best results.

7. Prolapse of the cord while a theoretical possibility did not occur once in 107 cases in which the head was dislodged from the pelvis.

8. The importance of recognizing that an internal contraction ring is a frequent cause of delay in labor and by no means an occasional occurrence.

9. A correct diagnosis is absolutely essential for success and is best obtained by freeing the head from pelvic control.

END-RESULTS IN TREATMENT OF PELVIC INFECTION*

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ALTHOUGH much has been written about the treatment of salpingitis, the fact, that in the management of every obstetric or gynecologic case, we must be concerned with the prevention or treatment of pelvic infection, makes the subject one of constant importance to us.

From laboratory studies and clinical observations, we now have certain fairly well established facts regarding salpingitis which, in the past twenty-five years, have greatly influenced treatment.

These facts are too well known to the members of this society to need any comment. However, I wish to mention those which have an important bearing on this study.

It is quite generally conceded, by the various authorities, that:

1. Seventy to 75 per cent of all cases of salpingitis are gonorrheal in origin, but by the time the patients come under observation, the cause, in a high percentage, cannot be demonstrated.
2. Gonorrheal salpingitis is a self-limited disease which, by the process of auto-sterilization, tends to heal spontaneously. In about 85 per cent of cases, healing would be complete provided reinfection could be prevented.
3. Infections, other than specific ones, are caused by organisms which may continue to live in the tissues for indefinite periods of time, regardless of symptoms.
4. Infections caused by non-specific organisms also tend to heal spontaneously. Nature's success, in healing such inflammations, depends upon the type of infection and period of time allowed for healing to take place.
5. Death from general peritonitis caused by extension of infection from the tubes or rupture of a tube is extremely rare.

All of these known facts, regarding pelvic infection and the clinical courses of the various types, indicate that any attack of such inflammation should first be treated by palliative means.

Furthermore, these facts and end-results, especially of operation, have compelled gynecologists and most general surgeons to adopt conservative methods of treatment. The result has been a great increase in the number of spontaneous cures, proving that many operations previously done were unnecessary.

As the Woman's Hospital policy has become more conservative, the number of patients treated and discharged without operation has gradually increased. The first part of this study was undertaken to determine how successful palliative treatment, in these cases, had been.

*Read, by invitation, at the Fifty-Eighth Annual Meeting of the American Gynecological Society, Washington, D. C., May 8 to 10, 1933.

A study was therefore made of end-results in 1021 admissions of 831 patients over a period of approximately ten years. Of these patients 671 were admitted once, 136 twice, 51 three times, and 28 four times.

The study of end-results, in patients treated by palliative means, was greatly facilitated by the fact that a fairly high percentage returned for examination in our follow-up clinics after being discharged from the hospital. The records showed that 81 per cent had returned for examination, an additional 8 per cent had been followed by the social service department and 11 per cent could not be traced after being discharged.

Patients were not admitted to the wards for treatment unless they were too ill to be ambulatory, or to have care at home. Ambulatory cases were treated in the out-patient department with intradermal protein injections, vaginal douches, medicated tampons and, when necessary, cauterization of the cervix. A considerable percentage of those admitted to the wards had had palliative treatment in the out-patient department, but failed to get adequate relief.

In our experience protein therapy has proved especially efficacious and often, in spite of rather extensive pelvic pathology, has kept patients sufficiently symptom-free to enable them while healing was going on, to continue with their routine duties. In such cases lack of rest undoubtedly retards, but does not necessarily prevent, healing.

As the milder cases were treated in the out-patient department, those admitted to the wards constitute a group with the more severe symptoms and more extensive pathology. It is therefore apparent that a résumé of results of palliative treatment in hospital cases does not give a true picture of the success which might be expected if all patients who apply for treatment were included.

Table I shows the age incidence of patients at the time of admission, and indicates that the greatest incidence of infection occurred in the latter half of the third decade of life.

TABLE I. AGE INCIDENCE

AGE	NUMBER OF ADMISSIONS
Up to 20	70
20 to 25	231
25 to 30	270
30 to 35	207
35 to 40	144
40 to 45	73
Over 45	26
Total	1021

Of the 831 patients admitted 422 were white and 409 colored. Of the 1021 attacks of infection treated 111 occurred in single women, and 910 in women who were, or had been, married.

Of the 831 patients admitted 301 were nongravid; 298 had had full-term deliveries; 246 had had spontaneous abortions and 95 had had induced abortions.

ETIOLOGY

The fact that more than one-half of the admissions were for recurrent attacks of infection, and that the attacks had in many instances been treated for long periods of time before admission, made it impossible definitely to establish the cause of the infection in a high percentage of the attacks. Table II shows that in 774 (72.8 per cent) of the 1021 admissions the cause of the inflammation could not be determined.

TABLE II. ETIOLOGY

TYPE OF INFECTION	NUMBER OF ADMISSIONS
Gonorrhea	56
Postabortal	118
Postpartum	70
Tuberculosis	3
Undetermined	774
Total	1021

DIAGNOSIS

The difficulty in establishing a high percentage of accurate diagnoses in such a series of cases is recognized. Throughout the course of treatment and observation of each patient, in the hospital and follow-up clinics, numerous bimanual examinations are invariably made by at least two surgeons. After a survey of these physical findings, the hospital temperature record, repeated white and differential blood counts, and in many cases blood sedimentation time estimations, it is felt that most of the errors in diagnosis can be eliminated. For instance, definite adnexal masses which, while under observation, are gradually absorbed and disappear, as signs of inflammation subside, can hardly be mistaken for other conditions. Likewise, a tender pelvic mass thought to be a tuboovarian abscess at admission may subsequently prove to be a cystic ovary or fibroid associated with mild inflammation.

Therefore, the established diagnosis in each case in the series is not based entirely upon findings at time of admission, but rather upon findings throughout the entire course of the disease.

TABLE III. DIAGNOSIS

TYPE OF INFLAMMATION	NUMBER OF ADMISSIONS
Acute Salpingitis	452
Subacute Salpingitis	105
Pyosalpinx	17
Tuboovarian Abscess	28
Chronic Salpingitis	419
Total	1021

Table III is a summary of the 1021 admissions classified according to the types of infection which existed at the time hospital treatment began.

PHYSICAL FINDINGS ON ADMISSION

Patients, admitted to the hospital, were treated for various degrees of inflammation, determined by physical findings, as follows:

1. Masses: Cases with definite adnexal masses.
2. Induration: Cases without palpable adnexal masses, but with induration or thickening, the result of tissue infiltration and plastic exudate, in one or both adnexal regions.
3. Tenderness: Cases of early or mild inflammation which, on examination, except for extreme tenderness of the pelvic organs, were free from physical findings.
4. Fixation: Cases in which the uterine appendages were fixed but were free from evidence of tissue infiltration of the adnexal or periadnexal structures.

In the series being reported 332 cases were treated for adnexal masses, 189 for thickening or induration, 96 for tenderness and 214 for fixation of the adnexal structures.

In addition to these findings diagnoses were based on the other usual signs of inflammation such as leucocytosis, fever, and rapid sedimentation time.

Of the 1021 admissions 641 were for salpingitis alone, 173 for salpingitis and retroversion, and 181 for salpingitis and myomas. These cases, which had other pathology as well as pelvic infection, were included in the series because they were treated primarily as cases of salpingitis, and were discharged without operation as soon as the inflammation subsided.

PALLIATIVE TREATMENT

Palliative hospital treatment consisted of rest in bed until the patients were afebrile, and subjective symptoms had practically disappeared. Patients were also kept in bed until the inflammatory exudate, as indicated by physical findings, had for the most part been absorbed. Of the 1021 inflammatory attacks, 504 (49.5 per cent) were treated with protein injections. Sterilized cow's milk was used. Injections were given in the gluteal muscles starting with one of 5 c.c. soon after admission, and repeating with 10 c.c. injections every other day for a maximum of approximately 10 doses. When necessary, sedatives and either cold or hot applications to the abdomen were used to relieve pain. Warm vaginal douches were given almost routinely as most patients had leucorrhea. They were used also for the beneficial effects of heat in giving comfort and assisting the absorption of the inflammatory exudate. An effort is made to eliminate infections of the external genitalia from which recurrent infections might occur.

Collections of pus were drained by posterior colpotomy 33 times in the 1021 admissions. Since protein injections have been used, many

masses, which formerly might have been drained through the culdesac, have been observed to absorb and disappear. If such masses bulge to much extent through the vault or toward the rectum, they are promptly drained to avoid rupture into the bowel, although when this happened cases invariably did well. As inflammation subsided uterine curettage was done 16 times to relieve excessive uterine bleeding.

PHYSICAL FINDINGS AFTER PALLIATIVE TREATMENT

Fig. 1 presents a summary of the cases according to the various degrees of inflammation at time of admission, and shows the results of palliative treatment, as indicated by physical findings. It demonstrates that, from 27 to 35 per cent of the cases, according to conditions for which they were treated, had no palpable pathology when

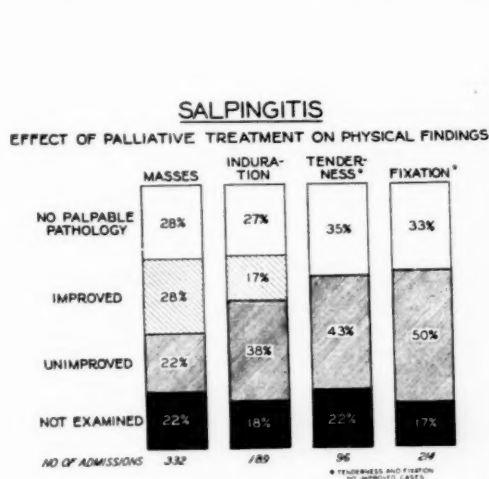


Fig. 1.

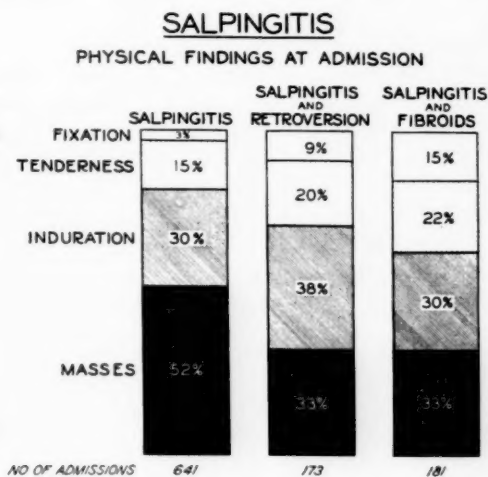


Fig. 2.

last seen. Many of those classified as "improved" or "unimproved" failed to heal while under observation, because they were followed too short a period of time to expect to get satisfactory results.

A high percentage of these cases, having persistent pathology, were symptom-free or had so few complaints that they would not return for examination.

Approximately one-fifth of the cases treated were not examined after being discharged from the hospital.

Fig. 2 shows the number of cases treated for salpingitis alone; those treated for salpingitis and retroversion, and those treated for myomas and salpingitis.

The types of inflammation which existed at time of admission are indicated in percentage. It will be noted that over one-half of the patients treated for salpingitis alone had adnexal masses, the most extensive type of inflammation, as compared to one-third of the cases

in the other two groups. This fact has an important bearing on the comparative results of palliative treatment in the groups as shown in Fig. 3.

In Fig. 3 it appears that cases with retroversion or myomas, in addition to pelvic infection, responded to treatment nearly as well as those with only salpingitis. This can be explained by the fact, previously noted in Fig. 2, that, as a group, patients admitted for salpingitis alone, had more severe inflammation in a higher percentage of cases, and were, therefore, relatively slower to heal. When patients with retroversion or fibroids develop salpingitis, symptoms are aggravated by the coexisting conditions, and hospital admission is therefore required for milder attacks of inflammation which respond more readily to treatment.

In general, it may also be stated, that healing of adnexal inflammation requires time in proportion to the degree of inflammation present. Hence, the longer a series of such cases can be followed the greater

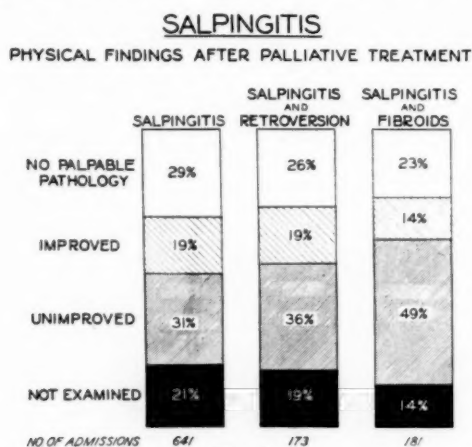


Fig. 3.

will be the percentage of spontaneous cures. Patients, when told that they have misplacements of their organs, or that they have uterine tumors, are, as a rule, more concerned about their welfare than those with only inflammation. Therefore, higher percentages of such cases can be followed for longer periods of time. For this reason the infections, from which they suffer, tend to heal more completely while they are still under observation.

End-results in cases of salpingitis alone would undoubtedly have shown, relatively, a higher percentage of spontaneous cures if the inflammation from which they suffered had been on the average as mild as in the other two groups, and if they could have been followed as satisfactorily.

In Fig. 4 the 641 cases, treated for salpingitis alone, are shown divided into two groups to determine the comparative success of pal-

liative treatment in acute and chronic cases. It will be noted that 30 per cent of acute cases and 28 per cent of the chronic ones had no palpable pathology after treatment. About one-half of the patients in each group had persistent pathology, although many of these cases, as indicated by physical signs, were distinctly improved.

In Fig. 5 the 641 patients, treated for salpingitis alone, were divided into two groups to determine the comparative success of palliative treatment of original and recurrent attacks of infection. It shows, as we might expect, that the original attacks responded more readily to treatment. However, 26 per cent of the patients, who had had recurrent attacks, when treated, became free from palpable pathology.

To summarize, results of palliative treatment, as shown in Figs. 1, 3, 4, and 5, indicate that from one-quarter to one-third of all patients became free of palpable pathology for as long as they could be followed; one-

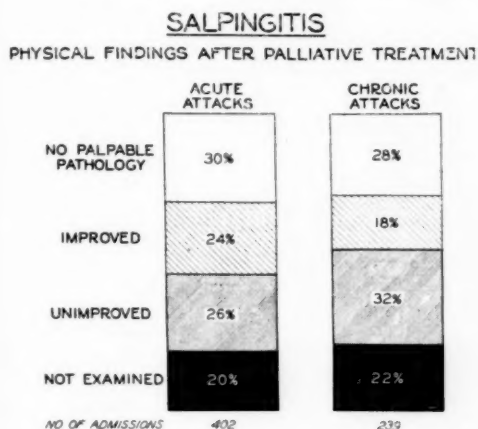


Fig. 4.

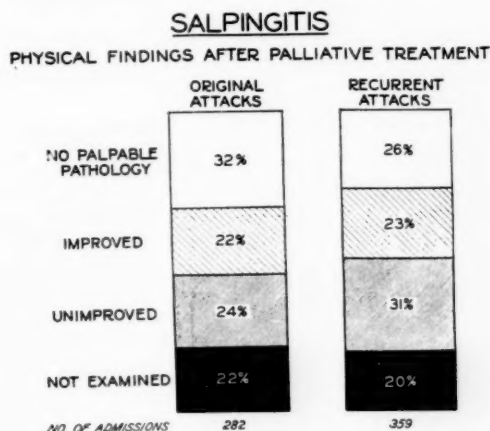


Fig. 5.

half had persistent pathology in spite of treatment and about one-fifth of the cases were never examined after being discharged from the hospital.

As we have no means of knowing which cases will heal spontaneously, we must consider it a possibility in all cases. As judged by physical findings alone, operation for salpingitis, without having tried palliative methods of treatment, would have been an injustice to nearly 30 per cent of the patients in any of the groups.

SYMPTOM RELIEF AFTER PALLIATIVE TREATMENT

Fig. 6 indicates the number of patients that had no palpable adnexal pathology after treatment and the percentage of these patients who were also symptom-free.

In the groups treated for retroversion and fibroids, as well as infection, the numbers of cases are too small from which to draw conclusions, but show the tendency for symptoms to persist after the infec-

tion has healed. In most cases persistent symptoms were those which might be attributed to the pathologic conditions which existed before infection occurred.

Fig. 7 presents a summary of cases which had persistent adnexal pathology after treatment. It shows the number of cases and the percentage, which in spite of failure of the infection to completely heal, were relieved of symptoms.

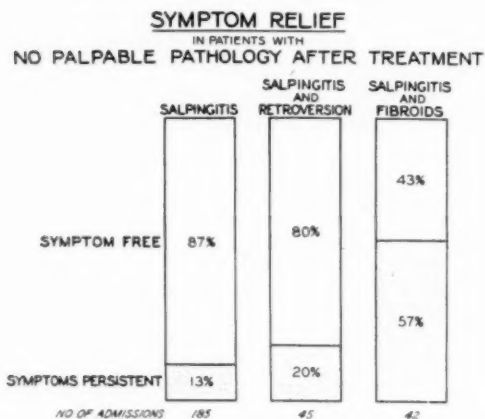


Fig. 6.

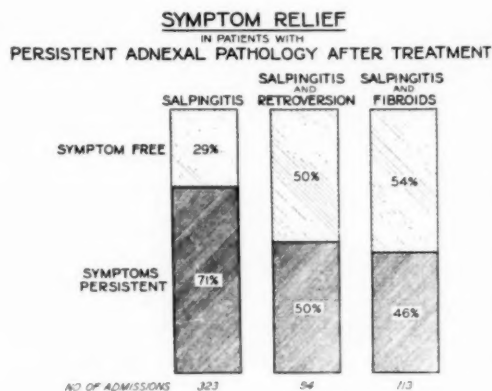


Fig. 7.

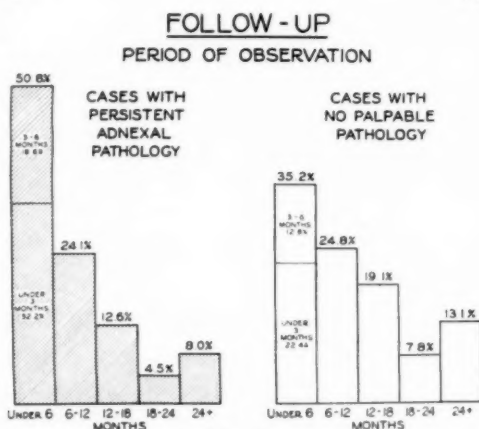


Fig. 8.

In the group of cases which had salpingitis alone, the smaller percentage of symptom-free cases can be explained again by the fact that this group, when admitted, had the most extensive pathology. Furthermore, for reasons stated above, it was the most difficult group to follow for a sufficient period of time in which to expect a high percentage of completely healed cases.

FOLLOW-UP PERIODS OF OBSERVATION

Fig. 8 is an analysis of the periods of observation of all patients in the series who were examined after discharge from the hospital. After 1021 admissions 825 (80.9 per cent) were examined in follow-up clinics.

An additional 8 per cent were visited by the social service department. Many of these were working and well, and refused to return. Approximately 11 per cent could not be traced after having been discharged from the hospital.

Such a high percentage of women suffer from some degree of pelvic inflammation, at some time in life, that they frequently seem to regard it as a more or less natural condition which does not concern them much at the time, and even less when symptoms have been relieved. Hence patients with pelvic inflammation who are symptom-free are very difficult to keep under observation.

INDICATIONS FOR OPERATION

Operation may be necessary in the chronic stage of any attack of salpingitis to relieve persistent symptoms regardless of how much pathology remains. Conditions with persistent symptoms, which require operation, range all the way from easily separated peritoneal adhesions to adnexal masses, which may necessitate removal of both tubes and ovaries.

The difficulty of palpating adnexal adhesions may make it necessary, in some cases, in order to discover the exact cause of symptoms, to resort to exploratory laparotomy.

Patients in this series, that ultimately came to operation in the chronic stage, included:

1. Some of the patients who after treatment had both persistent symptoms and adnexal pathology.
2. Patients who were relieved when treated but continued to have recurrent attacks of pain and disability.

It seems that the only basis, on which to decide to operate upon a patient, is the degree of discomfort and disability which she has after conscientious palliative treatment.

Disability may be due to failure of the inflammation to completely heal or to the tendency to recurrent attacks.

In this series 113 patients came to operation after one or more admissions for palliative treatment. Of these operations 48 were for adnexal disease alone, 19 for salpingitis and retroversion, 40 for salpingitis and fibroids, 6 for salpingitis and cystic ovaries.

An exhaustive study of the cases in this series which had palliative treatment confirms the opinion so well expressed by Miller that "operation should be done not because sequelae of the acute attack exist but because they cause symptoms."

COMPARATIVE RESULTS OF OPERATION DURING THE ACUTE AND CHRONIC STAGES OF INFECTION

In a previous study of 977 cases, the results of operation, by 29 surgeons, during the acute stage of pelvic infection, were compared to those of operation during the chronic stage.

The determination as to whether cases were acute or chronic depended not only upon the usual clinical signs of inflammation, such as physical findings, fever, leucocytosis, and rapid sedimentation, but also upon microscopic study of tissue removed at operation.

Fig. 9 shows the results of this study, and shows conclusively that operation in the acute stage is dangerous, destructive and accompanied by too high a percentage of unsatisfactory end-results.

Conservative operations were those in which sufficient tissue was left so that the patient had the possibility of a future pregnancy.

COMPARATIVE END-RESULTS OF OPERATION AFTER ORIGINAL AND RECURRENT ATTACKS OF CHRONIC SALPINGITIS

Enthusiasts for operation in the acute stage of pelvic infection have advised early operation to avoid the destruction of tissue caused by prolongation of the infective process, or recurrent attacks.

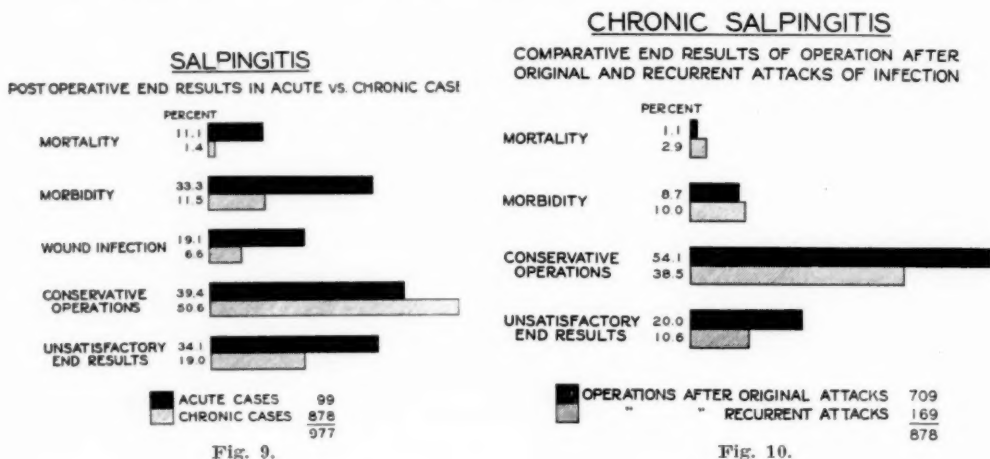


Fig. 10 indicates that the claims in regard to recurrent attacks are, to a certain extent, justified by the slightly increased postoperative mortality and morbidity, and the smaller percentage of conservative operations possible after recurrent attacks, as compared to those after the original attacks. These same surgeons have advised, at time of operation, a thorough excision of all diseased tissue. Dubose, one of the chief exponents of immediate operation in the acute stage, has published a series of patients in which only 35 of 164 (21.3 per cent) had conservative operations. It is interesting to compare this percentage with the 38.5 per cent of conservative operations which were done in this series in the chronic stage even after repeated attacks of inflammation. There is no sure way of predicting that a patient will have recurrent attacks. There can be no justification for doing destructive surgery in cases that with palliative treatment might never need operation.

CONCLUSIONS

1. Adnexal disease tends to heal spontaneously. There is no means of knowing which cases will heal and which may need operation. All cases should therefore have the benefit of conscientious palliative treatment before operation is considered.

2. In the series of 1021 attacks treated by palliative methods approximately one-half (48 per cent) either healed completely or became free from symptoms so that operation was not necessary. One-third (32.7 per cent) persisted after treatment with symptoms and palpable pathology. Some of these latter patients had to be operated upon as their symptoms could not otherwise be relieved. Approximately one-fifth (19.1 per cent) of the patients treated were never examined after being discharged from the hospital.

3. Operation for salpingitis is recommended in the chronic stage if palliative treatment has failed to relieve symptoms, and for the disability of attacks which tend to recur in spite of treatment.

4. The practice of operating to cure salpingitis in the acute stage of the infection is absolutely condemned. Nearly one-half of such operations are unnecessary, if cases are first treated by palliative means. Furthermore, patients operated upon in the acute stage are subjected to unjustifiable mortality and morbidity, unnecessarily destructive surgery, and to too high a percentage of unsatisfactory end-results.

5. Operations in the chronic stage, even after recurrent attacks of infection, yield end-results which justify the greatest conservatism in the management of salpingitis.

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BREECH DELIVERIES, WITH REFERENCE TO X-RAY MEASUREMENTS OF THE FETUS AND MATERNAL PELVIS*

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THE problem of cephalopelvic adaptation or disproportion could easily be solved in any given case if we were able to measure directly the biparietal diameter of the fetal head and the conjugata vera of the maternal pelvis. Clinical methods of measurement, however, offer only an indirect approach to the true conjugate, and prac-

*Read, by invitation, at the Fifty-Eighth Annual Meeting of the American Gynecological Society, Washington, D. C., May 8 to 10, 1933.

tically no information whatever concerning the actual size of the fetal head. While it is true that in vertex presentations the problem of adaptation or disproportion can be determined, in borderline cases, by engagement or lack of engagement of the head either before labor or after a test of labor, the diagnosis of such adaptation or disproportion in breech presentations can only be made in the last phase of actual delivery. It is at this time that the obstetrician may learn to his dismay that disproportion exists, in which case the result is a still-born or fatally traumatized infant and, in many instances, severe damage to the mother.

In recent years Thoms,¹ Jarcho,² Johnson,³ and Walton,⁴ among others, have directed attention to methods of pelvic and cephalic mensuration by means of the x-rays. It is my belief that radiologic cephalometry and pelvimetry should, if controlled and accurate readings can be achieved, furnish us with information of the greatest value in predicting cephalopelvic adaptation or disproportion. This belief has led to the preparation of this paper, the results of which were attained after considerable trial and a fair amount of error. While the work was going on Dr. Stewart H. Clifford was engaged in the task of x-ray cephalometry in the determination of fetal maturity in utero, the results of which are now in process of publication.⁵ These will be referred to from time to time in this paper for purposes of comparison.

On October 1, 1931, I undertook personal supervision of all breech deliveries on the house service of the Boston Lying-In Hospital, together with investigation of the x-ray measurements of fetal cranium and maternal pelvis in all cases of breech presentation where such measurements were practicable. This assignment expired on April 1, 1933, after a period of eighteen months. A series of 87 deliveries of presumably viable breech babies is presented, of which 39, or 44.8 per cent, were subjected to roentgen examination. In addition, 25 further cases of x-rayed breech presentations are to be tabulated, though they are not included in the assignment series for the following reasons:

- 11 were private cases of members of the hospital staff.
- 2 were delivered by breech extraction at home.
- 1 was delivered by breech extraction in another hospital.
- 4 were forceps deliveries of vertex presentations.
- 4 were normal deliveries of vertex presentations.
- 1 was delivered by version and extraction after becoming transverse.
- 2 were delivered by cesarean section.

Our results, collected and correlated, have furnished us with the data necessary to present this paper as a preliminary report of the value of x-ray measurements of fetus and maternal pelvis in breech presentations.*

*For lack of space, the extended tabulations could not be published.

CLINICAL RESULTS

The clinical results of the 87 deliveries in the breech assignment series were as follows:

Delivered by breech extraction.....	85
Delivered by abdominal cesarean section.....	2
Because of demonstrated disproportion.....	1
Because of previous cesarean.....	1
Mothers discharged well.....	86
Mother discharged dead, shock and hemorrhage.....	1
Babies discharged well.....	79
Babies discharged alive with	
Fractured clavicle	1
Brachial nerve injury	2
? brachial nerve injury	1
Babies dead	4
Stillborn, congenital lues (autopsy)	1
Died nine days after delivery, hydrocephalus, spina bifida, fractured skull, intracranial hemorrhage (autopsy)	1
Died within one hour of delivery, trauma, undoubtedly intracranial injury (no autopsy)	1
Transferred to Children's Hospital day after delivery with ? traumatic transection of cervical cord. Cord decompressed, no intradural injury found, but large extradural clot. Eventual death with paralysis from compression myelitis	1

This series is not large enough in itself to occasion special comment. The gross fetal mortality of 4.6 per cent is not high for such a series, and could be accounted lower if we rule out the case of congenital lues and that of hydrocephalus. The maternal death and the death of the infant within the first hour of life are the result of manual dilatation of the cervix and breech extraction in a case where the cord was found prolapsed in a multiparous breech labor when the os was only 4 cm. dilated. We do not hesitate to criticize the obstetric judgment in this case, for the mother would have undoubtedly survived had no interference been practiced, whereas the infant would not have been more irrevocably lost than actually was the case following a difficult delivery.

TECHNIC

For the purpose of making x-ray measurements the stereoroentgenometric technic described by MacKenzie Davidson⁶ and Clayton R. Johnson,⁷ modified in some measure to yield better controlled results, was selected. The theory on which this method is based is academically sound, and one of the principal purposes of this report is to discuss its practical value.

Let us consider, in connection with Fig. 1, that the construction OF represents either a radio-opaque body, or the distance between two bony and therefore radio-opaque landmarks. If an x-ray exposure is made from point A , the resulting shadow will be cast on the film at $A'A''$. If the same object is again photographed from another point of emanation of the ray, such as B , the resulting shadow will be cast on a second film at $B'B''$. From the two films thus obtained it is possible to reproduce schematically the crossed rays AA' and BB' , as well as the rays AA'' and BB'' , and to locate in space the points O and F at their respective intersections. Certain conditions, however, must be observed:

1. The tube-film distance, CC' , must be constant.
2. The shift of the tube, AB , must be constant.
3. The films on which the exposures are made must be accurately centered with relation to the midpoint of the tube-shift, C , and, therefore, to each other.
4. The dummy, or apparatus used for the schematic representation of the rays, must be constructed to reproduce the exact tube-film and tube-shift distances employed.

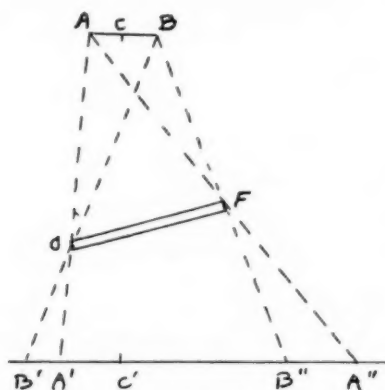


Fig. 1.— OF is object to be measured. Rays from tube focus A cast shadow $A'A''$ on film. Rays from tube focus B cast shadow $B'B''$ on film. Distance AB is $2\frac{3}{4}$ inches. Distance (perpendicular) CC' is 25 inches. When two films are accurately centered and superimposed on a view box the rays AA' , AA'' , BB' , and BB'' can be schematically reproduced by means of a dummy tube-shift, and the points O and F located in space; the distance OF as reproduced is measured directly, and gives the diameter of the object to be measured.

For making stereoroentgenometric exposures the patient is placed in the dorsal horizontal position on an ordinary x-ray table which is equipped with a stereoscopic tube-shift above, and a Potter-Bucky diaphragm, attachable to or detachable from the shift mechanism below. To measure the fetal head in a breech presentation, the tube should be centered midway in its longitudinal shift directly over the head, at or above the horizontal level of the maternal umbilicus. To photograph the pelvis, the tube should be centered about 2 in. above the horizontal level of the symphysis.

With the tube centered above the structure to be measured, the center of the film on which the exposure is to be made must be located to correspond exactly with the midpoint of the longitudinal tube-shift. This center point is determined by embedding in the midline of the radiosopic table two or three lead shot about 6 in. apart, in the direct plane of the longitudinal tube-shift; and by drawing transversely across the middle of the film cassette a wire, one end of which is permanently fastened through a hole drilled in the middle of the inner edge of the film-tray, the other clamped securely in a notch cut in the middle of the outer edge of the tray. The point of intersection of the shadow of this wire on the finished

film with a ruled pencil line drawn on the film through the shadows of the lead markers indicates the exact center of the film perpendicularly below the middle of the tube-shift.

As a control for the accuracy of the technic, and for the discovery of technical errors, two metallic rods, each 10 cm. in length, are attached over the lower abdomen of the patient in such a way that their shadows will appear on the developed film. The shadows should, naturally, be measured at 10 cm., but we have found our results satisfactory when these control measurements are accurate within 2 mm. of their real value.

With the tube centered over the fetal head and the tray containing the unexposed film in place, the Potter-Bucky diaphragm is released from its attachment to the shift mechanism and securely locked in its tracks. The tube is placed at one end of the stereo-shift. An exposure is made, using a Westinghouse Radiographic Heavy Duty Tube, with a $4\frac{1}{2}$ to 5 in. spark gap, and an exposure of 50 ma. for from six to twelve seconds. The cassette containing the exposed film is removed, and a fresh cassette containing a new unexposed film is placed in the tray; the tube is now displaced to the other end of the stereo-shift and the second exposure is made. Two stereoscopic films are thus obtained of the fetal head, and two more are made in like manner to measure the maternal pelvis.

Experience has taught us that certain points in technic must be rigidly observed if accurate readings are to be secured; these, briefly, are as follows:

1. A constant 25 in. or 63.5 cm. tube-film distance is employed.
2. A constant $2\frac{3}{4}$ in. or 7.0 cm. tube-shift is employed.
3. The apparatus must be rigidly locked when the longitudinal shift is made; otherwise, inertia may carry the tube beyond the shift-stop and completely invalidate the measurement obtained.
4. The Potter-Bucky diaphragm must be locked in its tracks, as otherwise in inserting the second film the carriage may be moved. This error will also invalidate the accuracy of the result.
5. The patient must not move during or between the two exposures. Ideally the fetus in utero should also remain motionless during this period: the great preponderance of our unsatisfactory readings have been due to the fact that we cannot control its intrauterine activity.

The two pairs of films are now developed and dried, after which they are ready for interpretation and measurement.

INTERPRETATION OF FILMS

For successful interpretation of cephalopelvic measurements the films should show sharp outlines of the fetal head and sharply defined end-points of the true conjugate. The cephalometric films should reveal a clear outline of either the frontal or sagittal plane of the head, from which may be obtained the biparietal or occipitofrontal diameter respectively. (Figs. 2 and 3.) The former is recognizable by its pear-shaped shadow, the mental point of the mandible, and the position of the orbits and the large fontanel; the latter by the shadow of the occiput, fontanels, brow, orbits, maxilla and mandible.

Experience has shown that in the majority of x-rays taken in accordance with the technic described the fetal head will be revealed in lateral or anteroposterior silhouette. Occasionally, the rays will reveal the head partially rotated (Fig. 4), or in a partially flexed coro-

nal plane, in which case neither the occipitofrontal nor the biparietal diameter can be accurately measured. More frequently one of the pair of films will show a measurable cranial outline, while in the other

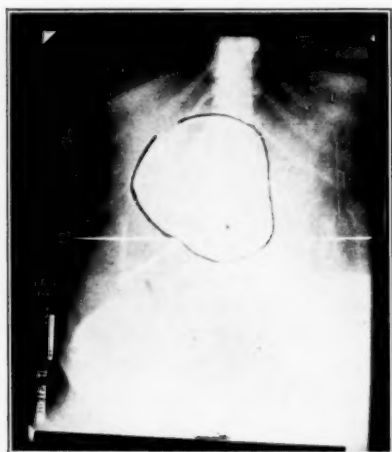


Fig. 2.



Fig. 3.

Fig. 2.—Illustrating satisfactory film of frontal plane of fetal head, from which the biparietal diameter may be obtained directly. This view was revealed in 8 per cent of our successful films.

Fig. 3.—Illustrating satisfactory film of sagittal plane of fetal head, from which the occipitofrontal diameter may be obtained directly. This view was revealed in 89 per cent of our successful films.



Fig. 4.—Illustrating oblique view of fetal head, from which neither biparietal nor occipitofrontal diameter may be read. Such a view, when obtained in a film which otherwise is technically successful, renders measurement unpredictable.

the outline will either be markedly displaced or differently shaped, due to movement by the fetus.

In our 62 breech cases investigated by stereoroentgenometry 24, or 37.2 per cent, were found to show marked movement of the fetal head

during or between exposures. In 38, or 62.8 per cent, presumably predictable measurements were obtained. Thirty-four of these, or 89 per cent, gave a satisfactory occipitofrontal silhouette, and 3, or 8 per cent, a clear anteroposterior view. One, or 3 per cent, was not measurable accurately because of the obliquity of the vertex plane.

These figures are few, but they correspond fairly accurately with those obtained by Clifford, who found 78 per cent of measurable results in 124 vertex presentations. We believe that the difference between 62.8 per cent and 78 per cent in the two series is due to the fact that the head is less apt to move during or between exposures when it is relatively splinted by the lower uterine segment than when it is free in the fundus.

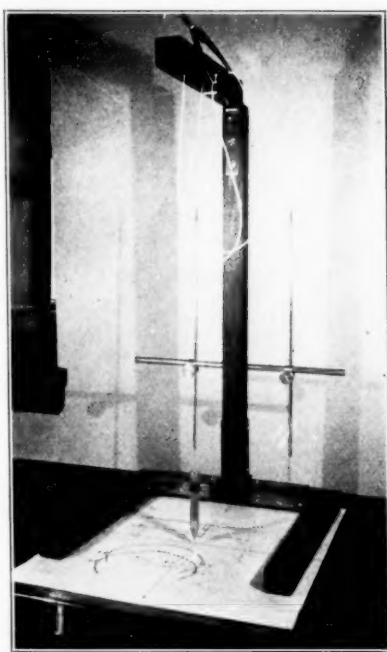


Fig. 5.

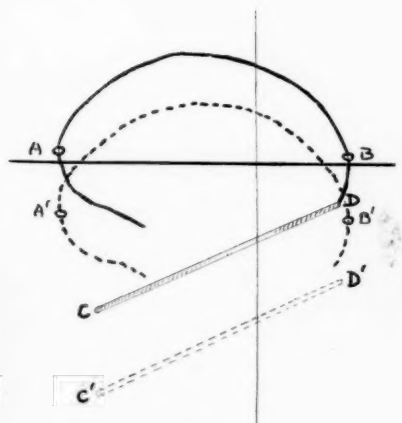


Fig. 6.

Fig. 5.—Illustrating dummy placed on superimposed and centered films, with plumb-bob centering the midpoint of the schematic tube-shift perpendicularly over the central points. The elastic cord, with free ends attached to divider arms, will be used for schematic representation of the paths of the rays. The metallic pointers are ready for use.

Fig. 6.—Showing a pair of "A" class films correctly superimposed and centered for measurement. Points A and A', and B and B' represent the homologous end-points on the two films for the occiput and brow respectively. CD and C'D' represent the shadows cast by one of the metallic 10 cm. rods.

METHOD OF READING STEREO-ROENTGENOMETRIC RESULTS

For the purpose of schematic reproduction of the paths of the crossed rays from which we derive the desired end-points in space, a dummy, represented in Fig. 5, is employed. This consists of a base, a vertical upright, and a horizontal arm, the whole apparatus not unlike a gallows. To it are attached two pointed metallic rods

which work in sleeves and which are mounted on universal joints which may be fixed in any location within their range to spot a given point in space. Since this dummy must be constructed to a scale which reproduces exactly the tube-shift and the tube-film distance used in making the film exposures, it follows that the distance from the bottom of the apparatus to the under surface of the horizontal arm must be 25 in., and that the three gimlet holes bored through the horizontal arm to represent the $2\frac{3}{4}$ in. tube-shift with the midpoint between must be exactly $1\frac{3}{8}$ in. apart. A single elastic cord is threaded through the two-end gimlet holes corresponding to tube-foei *A* and *B*, and its free ends are attached to the two tips of a pair of dividers. Through the middle hole, corresponding to the midpoint of the shift, *C*, is threaded a cord to the end of which is attached a carpenter's plumb-bob.

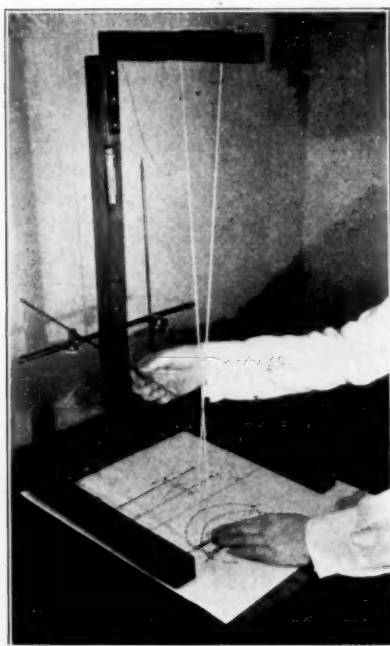


Fig. 7.

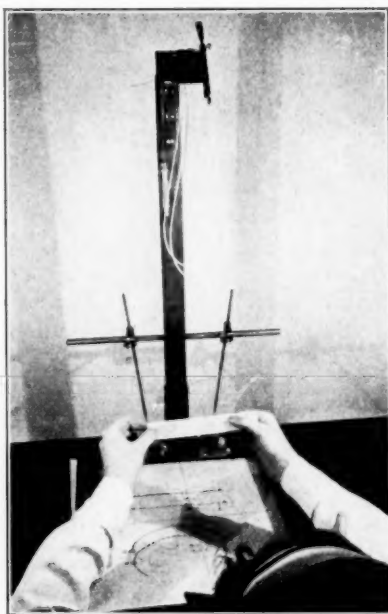


Fig. 8.

Fig. 7.—“Spotting” the crossing of the schematic rays in space, and locating the occiput. The operator is adjusting the tip of the pointer to the crossing of the cord, representing the crossing of the rays *AA'* and *BB'* in Fig. 1.

Fig. 8.—Both points, *O* and *F*, have been located and spotted in space. Reading the distance between the two tips of the pointers with an ordinary centimeter rule gives the distance *OF* direct.

The desired end-points are now located in space as follows (cf. Fig. 1):

1. The extremities of the diameter to be measured are marked on each film by piercing it at the desired points with a safety pin.
2. The films are superimposed upon one another on an illuminated view-box in such a way that the longitudinal pencil lines through the shadows of the lead markers coincide, and that the shadows of the transverse wires likewise coincide, thus accurately superimposing the centers of the two films. (Fig. 6.)
3. The dummy is placed upon the superimposed films in such a way that the longitudinal axis of the horizontal arm is parallel to and above the longitudinal axes of the films, and that the plumb-bob indicates that the midpoint, *C*, of the shift is perpendicularly above the centers of the films. (Fig. 5.)

4. With the elastic cord crossed once upon itself, the divider arms are adjusted in such a way as to bring the ends of the cord directly down upon the homologous end-points of the two films.

5. The tip of one metallic pointer is adjusted to spot this point of crossing of the cord in space, and is fixed in position. Thus rays AA' and BB' are schematically reproduced, and point O is located in space. (Fig. 7.)

6. Rays AA'' and BB'' are similarly reproduced, and point F spotted in space.

7. Measurement of the distance between the tips of the pointers gives the direct measurement of the diameter OF . (Fig. 8.)

One or both of the 10 cm. metallic rods are then measured as a control.

PRACTICAL APPLICATION OF STEREOROENTGENOMETRY IN BREECH SERIES

Since there is no academic reason why x-ray measurements cannot be carried out in any delivery series, our assignment of breech cases was undertaken with the purpose of accomplishing stereoroentgenometry in every case where it might prove feasible. The fact that we succeeded in doing this in only 39 of the 87 delivered cases is due to several factors, of which the following are most important:

1. A correct diagnosis of presentation must be made. Many of our cases entered the hospital in labor without the true position of the fetus determined. In not a few the diagnosis of breech was not made until relatively late in labor. In an occasional case a preliminary x-ray exposure was necessary to clinch the diagnosis of presentation.

2. The diagnosis of presentation must be made early enough to allow the taking of roentgenometric films before, or early in, labor. Conscious cooperation on the part of the patient to prevent movement on the table is indispensable, if satisfactory films are to be secured. Such cooperation is practically impossible if labor is active, whether or not analgesic drugs have been administered. Movement by the patient on the table during or between exposures precludes satisfactory measurements either of the fetal head or of the pelvis.

CLASSIFICATION OF FILM RESULTS

From the standpoint of obtaining satisfactory measurements of the fetal cranium by means of the x-ray, we have divided our films into three groups, as follows: "A" class, "B" class, "Zero" (0) class.

"A" class films comprise those in which no appreciable movement of the fetal head has taken place during or between exposures. This class may be recognized by superimposing the films with the longitudinal pencil lines coinciding, and sliding one film up or down upon the other until the two fetal head shadows come together. If they coincide exactly in outline, we are willing to predict the greatest accuracy of measurement. (Fig. 9.)

"B" class films comprise those in which slight lateral movement of the fetal head has taken place between exposures, but without flexion, extension, or rotation. By superimposing the films with the fetal head shadows coinciding exactly, we find that while the longitudinal pencil lines on the films do not coincide, they nevertheless remain parallel. If separation between the lines does not exceed $\frac{1}{4}$ in., the measurement of the head can still be accurately determined. (Fig. 9.)

"Zero" class films comprise those in which marked lateral movement, flexion, extension, or rotation of the head has occurred during or between exposures. If flexion or extension has occurred, superimposition of the films with head shadows coinciding will result in crossing of the longitudinal lines. If rotation has occurred, the two head shadows cannot be made to coincide. In any such cases accurate measurements are impossible. (Fig. 10.)

This classification of films is based entirely upon experience with obtaining x-ray measurements of the fetal cranium which are absolutely or practically identical with caliper measurements of the infant taken within twenty-four hours after delivery. Since the films used to measure the maternal pelvis are separate from those taken to deter-

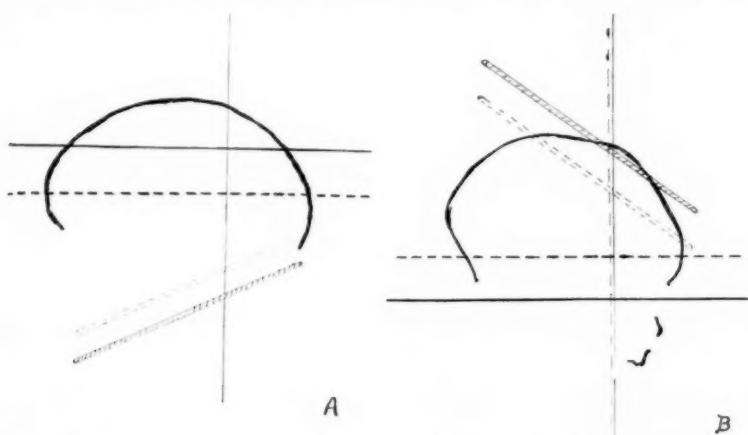


Fig. 9.—Illustrating method of determining "A" class and "B" class films. "A" class films give perfect coincidence of outline when superimposed with the longitudinal axes of the films coinciding.

"B" class films show the longitudinal axes closely parallel but not coinciding when the head shadows are accurately superimposed.

Both "A" and "B" class films give presumably accurate measurements.

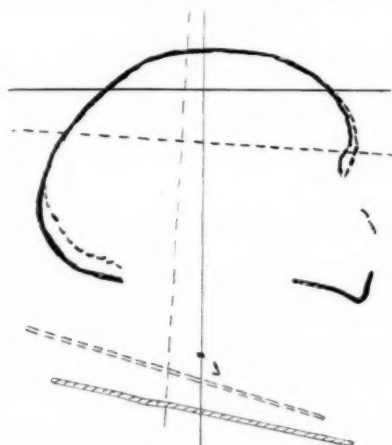


Fig. 10.—Illustrating "Zero" class film. Attempts to make the head shadows coincide are unsuccessful because rotation has occurred during or between exposures. In addition some flexion or extension has taken place, as shown by the crossing of the longitudinal pencil lines when heads coincide as nearly as possible.

This type of film is useless for determining cephalic measurements.

mine the fetal skull measurements, it follows that the classification as "A," "B," or "O" has no significance as an index of pelvimetric accuracy.

ACCURACY OF RESULTS OBTAINED BY X-RAY CEPHALOMETRY

Sixty-four breech cases were subjected to x-ray measurements of the fetal head in utero. Of these, 2 were measured by the Thoms technique, using a perforated lead plate; 62 were measured by stereoroentgenometry.

"A" class films obtained	22
(Controlled by postpartum measurement of baby's head....	17)
"B" class films obtained	16
(Controlled by postpartum measurement of baby's head....	14)
"O" class films obtained	24

In the 13 "A" class films where the baby's head was measured with calipers within seven days of the date of the x-ray measurement, it was found that 13, or 100 per cent, were accurate within 5 mm., and 12, or 92.3 per cent, accurate within 2 mm. This compares favorably with Clifford's findings that in 91 "A" class films, including both vertex and breech presentations, 99 per cent were accurate within 5 mm., and 97 per cent within 3 mm.

In the 8 "B" class films where the baby's head was measured within seven days of the x-ray measurement, it was found that 8, or 100 per cent, were accurate within 5 mm., and 6, or 75 per cent, within 3 mm. Clifford's comparative figures for 26 "B" class films give 100 per cent and 80 per cent respectively.

In the 4 "A" class and 6 "B" class films where the time differential was more than a week we would expect to find an increase in the actual measurement of the head over that obtained by x-ray proportionate to the time elapsed. The figures reported do not show any such definite proportion, and must wait for final interpretation until we learn more accurately the element of normal variability in the intrauterine growth of the fetal head. One can, however, postulate the probable accuracy of the x-ray figures in these cases from the controlled measurements obtained by Clifford in cases where pregnancy was interrupted shortly after roentgenometry for therapeutic reasons; such measurements are included in the 99 to 100 per cent successful readings in the 117 cases referred to in the two preceding paragraphs.

At the outset of our work, before we understood fully that "Zero" class films could not be expected to give accurate results, we went through the motions of determining measurements in many specimens of this class. The discrepancies obtained between x-ray and true measurements amounted in some cases to 29 mm., and it was not long before we recognized the inaccuracy of readings from "Zero" class films on theoretical as well as practical grounds. We have, therefore, given up all attempts to predict cephalic measurements in these cases.

The foregoing figures indicate that in this series of breech presentations the initial measurement of the fetal head in utero was presumably accurate in 62.8 per cent of the cases. In those in which no satis-

factory measurement could be obtained the error was due in the vast majority of instances to movement of the fetus, and in a small proportion to the presentation of an oblique diameter of the head to the path of the rays.

Serutinizing the "presumably accurate" measurements in 38 cases we find:

Accurate within 5 mm., controlled by actual measurement of the baby's head less than seven days after roentgenometry----	21 cases (55.2%)
Possibly accurate, controlled by actual measurement of the baby's head from eight to forty-two days after roentgenometry -----	10 cases (26.3%)
Possibly accurate, uncontrolled by actual measurement, from eight to seventy days before delivery-----	6 cases (15.8%)
Probably inaccurate, oblique view, uncontrolled by actual measurement of the baby's head, forty-eight days before delivery--	1 case (2.6%)

To most of our successful x-ray measurements of the fetal head the objection may be raised that the reading reported is for the occipitofrontal diameter, whereas the essential diameter to be measured is the biparietal. This objection is important, since only 8 per cent of our successful films give a direct reading of the latter. We adopted, however, at the outset of the work, pending confirmation of his results by our own experience, the rule suggested by Thoms for the computation of the biparietal diameter from the measured occipitofrontal. His figures, gleaned from 149 cases, are here tabulated, with ours from 75 cases placed beside them in parentheses:

For O.F.D. of 12.5, subtract 2.5	for B.P.D. (2.7)
For O.F.D. of 12.0, subtract 2.5	for B.P.D. (2.2)
For O.F.D. of 11.5, subtract 2.0	for B.P.D. (1.4)
For O.F.D. of 11.0, subtract 1.75	for B.P.D. (1.5)
For O.F.D. of 10.5, subtract 1.5	for B.P.D. (1.25 ?)

In other words, our technic shares the disadvantage common to all methods so far reported for cephalometry, that the essential diameter to be measured for purposes of comparison with the pelvis through which it has to pass must, more often than not, be computed indirectly. This limitation is recorded with regret as a serious obstacle to the achievement of mathematically accurate results.

ACCURACY OF RESULTS OBTAINED BY X-RAY PELVIMETRY

In the pelvimetric phase of our work we have been faced with the well-nigh insuperable difficulty of securing control measurements of the conjugata vera for purposes of comparison. It is impossible to measure this diameter with mathematical accuracy by any means other than a rule, caliper, or other metric device, at autopsy. In the one

case, which, because it was not a breech delivery, is not included in our series, in which postmortem examination was done on a patient whose pelvis had previously been measured by x-ray, the radiologic conjugata vera and the actual conjugata vera tallied identically at 12.0 cm. The next most accurate method of measuring the true conjugate directly is at the time of cesarean section or other laparotomy, and we were fortunate enough to find one case in our assignment series in which these conditions were fulfilled, the x-ray conjugata vera tallying exactly with the measured diameter at 10.0 cm.

Realizing at the outset of our investigations the impossibility of achieving accurate control measurements for our x-ray mensuration of the true conjugate, we decided upon recording the diagonal conjugate in the cases in our breech assignment series. This was easily done, because all cases were delivered under general anesthesia, and the readings of the diagonal conjugates obtained were tabulated. In 29, or 33 per cent of the breech series, satisfactory x-ray measurements were obtained and checked against determinations of the diagonal conjugate. In one additional private case the controlled information is at hand. Eighteen, or 60 per cent of the cases, showed the diagonal conjugate greater than the x-ray conjugata vera, of which 10, or 33 per cent of the total number, gave a reading from 1 to 2 cm. greater. Ten, or 33 per cent of the cases, showed a measured diagonal conjugate less than the x-ray measurement of the true conjugate.

We have no explanation at present to offer to account for these discrepancies, save that we are uncertain, in some cases, as to the exact location of the promontory in the film. The top of the symphysis is easy to locate, but the shadow of the promontory, when taken from directly above with the patient recumbent, is often ill defined in outline and poorly contrasted against the shadow of the sacrum below. This bad differentiation may be lessened by taking the exposures with the patient in the semireclining position as advocated by Thoms, since in this posture the pelvic inlet is brought closer to the horizontal plane and the promontory is more sharply defined. This was carried out in a few of our patients postpartum, but we found it impracticable in the full-term gravida, because of the higher dosage of rays required to penetrate the greater thickness of the intervening tissues and fluid, and because the protrusion of the abdomen tended to interfere with the tube-shift.

On the other hand the manual measurement of the diagonal conjugate is also, at best, only an approximation. We feel strongly that there is room for much more work with accurately controlled x-ray pelvimetry, before we can place entire reliance on measurements obtained in this way.

VALUE OF COMBINED X-RAY CEPHALOMETRY AND PELVIMETRY IN
BREECH DELIVERY

It would be gratifying to me to conclude this article with a series of reported cases in which the use of antepartum x-rays pointed the way clearly toward cesarean section rather than breech delivery through the pelvis because of disproportion. Such a series cannot be adduced from the work on this subject done in our clinic to date. We can, however, report one such case, which seems well worth outlining in some detail:

Mrs. F. reported to the clinic on April 25, 1932. She was essentially a primigravida, in that her only previous pregnancy had terminated in a two months' abortion in 1929. Confinement was expected August 26. Her clinical measurements on her first visit were as follows: intercrystal 24.5 cm., interspinous 21 cm., external conjugate 17 cm., bisischial 7 cm., promontory not reached on vaginal examination. Antepartum examination on August 31 showed a breech presentation, R.S.A. X-ray measurements on the same date gave "A" class films, from which the occipitofrontal diameter measured 11.8 cm. (estimated biparietal 9.3 to 9.8 cm.), and a true conjugate of 10.0 cm.

Because of the borderline type of pelvis, and the close approximation of the estimated biparietal diameter to the x-ray true conjugate, an elective cesarean section was done Sept. 1. Immediately before operation, with the patient under anesthesia, the diagonal conjugate was determined to be 11.5 cm. At operation the conjugata vera was measured from within at 10.0 cm. The baby was born in good condition, weighed 7 pounds 12½ ounces, and the maternal measurements showed an occipitofrontal diameter of 11.9 cm. and a biparietal diameter of 9.7 cm. Mother and baby discharged well on Sept. 16.

Acknowledgment is made to Dr. Stewart H. Clifford, whose paper on this subject will be published in a subsequent issue of the JOURNAL. Practically all the refinements of technic which have contributed so much to accuracy and to control of results, are due to Dr. Clifford's supervision.

SUMMARY AND CONCLUSIONS

1. Stereoroentgenometry provides a method for antepartum measurement of the fetal cranium, and for measurement of the maternal conjugata vera.

2. In 62.8 per cent of the breech presentations with which this paper deals, presumably accurate measurements of the fetal head were obtained at the first attempt. Thirty-seven and two-tenths per cent of the cases were unmeasurable because of fetal motion in utero.

3. Control measurements of the baby's head, taken after delivery and within seven days of stereoroentgenometry, indicated that the measurements were accurate within 5 mm. in 100 per cent of the cases, and within 3 mm. in from 75 to 95 per cent.

4. Stereoroentgenometric measurement of the conjugata vera is difficult to control with any degree of mathematical accuracy. Such

measurements have been confirmed in the 2 cases in our clinic in which the patient came to operation or autopsy, and in which control measurements were possible.

5. Stereoroentgenometry has been of value in one case in our series, in which it gave confirmatory indication for the performance of elective cesarean section in a primiparous breech presentation.

6. A reasonable expectation may be entertained that repeated x-ray investigation of breech presentations before delivery may, with greater experience, yield a higher proportion of accurately measurable results.

475 COMMONWEALTH AVENUE.

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THE ALLEVIATION OF PAIN IN OBSTETRICS*

JOHN H. MOORE, M.D., F.A.C.S., GRAND FORKS, N. D.

(From the Red River Valley Clinic)

IT IS very gratifying to one who has long been interested in the alleviation of pain in obstetrics, and who has pioneered a little in some phases of that subject, to note the increasing interest of our profession in this important field; but it is sometimes alarming to see the manner in which this alleviation of pain is accomplished.

From an attitude of apparent indifference to the suffering of the parturient woman, some have turned to an oft-expressed "ideal of painless labor." They have attempted, by massive doses of unintelligently administered drugs, to obtain amnesia, analgesia, and anesthesia without thought of the not-infrequent deleterious effects on the mother and baby. Too often has each new drug that has a sedative or hypnotic action been seized upon as the perfect agent for relief of pain in childbirth; too often have such physicians, with no thought of the physiologic action of the drugs they were so indiscriminately using, jeopardized the lives of both the women in labor and their offspring.

Relief from pain in labor is one of the greatest assets to the well-being of the average mother, but let him who gives that relief never lose sight of the fact that pain presents peculiar problems to the obstetrician. With the thought of the comfort of his patient in mind,

*Presented at a meeting of the Watertown District Medical Society, Watertown, South Dakota, August 9, 1932.

he must consider her safety and the safety of her baby. He must distinguish between analgesia and anesthesia, between hypnosis and narcosis. He must learn that the woman in labor does not enjoy an immunity to injudicious medication but rather that she is highly susceptible to it.

It is possible to alleviate safely the pain of labor. It is possible to make of labor an incident rather than an ordeal. Certain knowledge is essential to do this intelligently. This essential knowledge may be called the "A, B, C" of pain relief in labor.

A. Know Your Patient, Physically and Emotionally.—When she comes to you for prenatal care, take time to study her as an anesthetic as well as an obstetric risk. Note those factors which might, for example, make her a poor risk for a general anesthetic. Study her reactions to the common discomforts of pregnancy. Learn of her mental attitude toward her approaching labor. Assure her that you have ways for making labor easy. Then, after you have studied her during the prenatal period, formulate a plan by which you propose to relieve her of pain in labor. Sometimes that plan will have to be changed and sometimes no plan will suggest itself until the patient is seen in labor, but a careful analysis of each patient along the lines suggested will help to simplify the problem.

I want to emphasize the importance of individualizing each patient. The obstetrician who does the best by his patients in the matter of pain relief is the one who familiarizes himself with the action of the drugs to be used and then selects the drug or drugs best suited to the individual patient. In other words, he fits the drug to the patient, not the patient to the drug. The failure of most so-called "methods" for relieving the pain of labor is due to the fact that they are not flexible enough to allow for the individual variations encountered.

B. Know the Action of the Drugs You Use.—I once heard a doctor state that he never used scopolamine in labor because it produced "blue babies." Instead he ordered morphine sulphate in one-fourth grain doses "when the pains became severe, and this could be repeated if necessary." It scarcely needs to be added that he did not escape cyanosis in the newborn with this technic!

Several years ago, when the injectable barbiturates first came into use, I saw a near fatality in obstetrics because the attending physician did not know that two powerful respiratory depressants, the barbiturates and morphine, should not be used in close association in the same patient.

Nitrous oxide oxygen has been used in obstetrics for years. The rapidity of its action, plus the prompt recovery, has made it particularly valuable for the so-called intermittent type of anesthesia in labor. We need to remember that it can become one of the most dangerous of all anesthetics when cyanosis is allowed to occur. Some physicians

and some anesthetists even now mistake asphyxia for anesthesia. Lundy's admonition to "keep the patient pink" is of paramount importance. While a transient cyanosis may do no harm, any prolonged cyanosis is dangerous.

C. Know the Mechanism of Labor and the Progress Each Individual Patient Is Making.—The latter requires the closest attention of the obstetrician. It cannot be left to chance or to a set of routine orders. I do not believe it is good obstetrics to have a "blanket" set of orders for analgesia and anesthesia and to try to cover each patient with it. Pain relief in labor requires more, not less, of the obstetrician's time. It requires a more accurate diagnosis of presentation and position, more careful study of the mechanism of labor and a more careful supervision of the patient. Unless one is prepared to give that added time and study he should not attempt it.

For purposes of illustration, I have reviewed the records of my last 1000 consecutive deliveries where the fetus had reached the period of seven months' gestation, to show that no one method of pain relief was applicable to all. These were all hospital patients.

Three main groups of analgesic and anesthetic agents were used:

- Group I. Those in whom pantopon scopolamine was used as the basic anesthetic agent; including 347 primiparas and 259 multiparas.
- Group II. Those in whom a barbiturate was used as the basic anesthetic agent; comprising 59 primiparas and 112 multiparas.
- Group III. Those in whom inhalation anesthesia only was employed; 50 primiparas and 173 multiparas.

There was one maternal death, a multiparous patient with decompensated mitral stenosis who had had no prenatal care and who died thirty-six hours after labor of pulmonary edema. Her baby survived. Ether anesthesia was used for thirty-five minutes.

The gross fetal mortality was 28 or 2.8 per cent. A dead fetus before onset of labor was noted in 14 or 1.4 per cent. Deformity, incompatible with life occurred in 2 or 0.2 per cent. The corrected mortality therefore was 12 or 1.2 per cent.

There is but one rule to follow in determining the time for beginning analgesia or anesthesia, namely, the suffering of the patient. Something is given for the relief of pain just as soon as the patient begins to feel uncomfortable, no matter how early in labor. What should be given depends upon a thorough knowledge of the "A, B, C" as outlined earlier.

I do not recommend any one "method" for the relief of pain in labor. It is important to remember that the perfect analgesic or anesthetic agent has not yet been discovered. At the present time a combination of drugs seems to possess advantages over single agents in labor.

ORDINARY TECHNIC IN AVERAGE NORMAL LABORS

When the patient first begins to complain of pain, she is given pantopon, 0.011 gm. and scopolamine stable (Roche), 0.00066 gm. by hypodermic or two capsules of sodium amytal (0.396 gm.) or two capsules of pentobarbital sodium (0.198 gm.) by mouth. The room is darkened and all unnecessary manipulation of the patient is prohibited. From forty-five minutes to one hour later she is given scopolamine stable (Roche), 0.00066 to 0.00033 gm. by hypodermic, depending upon her reaction to the first medication. At intervals of from one to two hours thereafter, she is given scopolamine stable (Roche) 0.00033 gm. by hypodermic until the first stage is well advanced. At this time sodium amytal or pentobarbital sodium in 0.5 gm. dose in 5 c.c. of sterile distilled water is given intramuscularly into the deltoid or the same dose of the barbiturate may be administered as a retention enema. This produces a condition bordering on obstetric analgesia in from twenty to thirty minutes and its effect persists for from one to two hours.

In some instances delivery may be effected without the aid of any inhalation anesthetic but usually nitrous oxide oxygen, ethylene oxygen, or ether is added for the actual delivery. One should caution the anesthetist, when an inhalation anesthetic is to be given to a patient who has had a barbiturate, that such a patient needs only about half the anesthetic that would be required by a patient who had not had this basic preparation.

UNSATISFACTORY RESULTS OF THE ABOVE TECHNIC IN AVERAGE
NORMAL LABORS

1. *The Intravenous Administration of the Injectable Barbiturates.*—The effect is too abrupt. The initial drop in blood pressure is sudden and, sometimes, alarming even though the recommended rate of injection is not exceeded. If given early in labor the contractions frequently cease. If given in the second stage larger doses are required to secure sedation and one may find himself with a patient who is under a general anesthetic, the effect of which cannot be terminated.

2. *The Use of the Barbiturates Followed by Morphine.*—Clinically, the barbiturates and morphine are known to be respiratory depressants. I have never seen evidence of asphyxia neonatorum in cases where the mother has been given barbiturates alone, nor in cases where scopolamine and the barbiturates have been used. I have seen instances where babies have been cyanotic at birth and have remained so for several hours following the administration of even 0.008 gm. of morphine to the mother after she had been given an initial dose of some barbiturate earlier in labor.

The barbiturates seem to hasten the softening and dilatation of the cervix when used in doses not exceeding 0.5 gm. orally, intramuscularly or by rectum. If the use of morphine is contemplated during labor it should be given first, not within three hours of the expected birth, and the dose should not exceed 0.008 gm.

3. *The Use of the Barbiturates as the Exclusive Analgesic and Anesthetic Agents Throughout Labor.*—My experience has been that the required dosage is too large to warrant this procedure. One must give almost a depressant dose to produce sufficient anesthesia. The anesthesia produced is not controllable.

MODIFICATION OF TECHNIC IN ABNORMAL LABORS

1. *The Occipitoposterior Position.*—The barbiturates are very effective in relieving the annoying backache of the early first stage. Softening and dilatation of the cervix seem to be hastened. I have had my best results with sodium amytal given orally. An initial dose of pantopon, 0.011 gm. adds to the effectiveness of the sodium amytal. Scopolamine may be used when labor is well established.

2. *Breech Labors.*—A technic similar to that used in occipitoposterior positions is effective.

3. *Elective Cesarean Section.*—The barbiturates act ideally as the basic anesthetic. Sodium amytal, sufficient to insure eight to ten hours' sleep, is given the night before operation and half the night dose is given in the early morning, three hours before the patient goes to surgery. Ethylene oxygen is the general anesthetic of choice. The patients sleep most of the day of operation and abdominal pain is rare.

4. *The Barbiturates in Eclampsia.*—In my opinion, an imminent or actual eclamptic seizure offers the one indication for the use of the barbiturates intravenously. Their action is definite, prompt, and gratifying. I have not found that hypertension is a contraindication, but the injection must be made slowly or the preliminary drop in blood pressure may prove excessive. I recommend sodium amytal in from 0.5 to 1 gm. doses, given in 10 per cent solution in sterile distilled water at a rate not to exceed 1 c.c. per minute. Hypertonic dextrose solution is given intravenously following the sodium amytal injection.

SUMMARY

1. Adequate pain relief in labor must be based on a careful individual study of each patient and a careful study of the drugs employed. A program of pain relief requires more, not less, of the obstetrician's time.

2. There is no one "method" which gives adequate relief in all cases. The best results are obtained by the use of a combination of drugs.

3. Every parturient mother has a right to relief of pain in labor. That relief can be given safely if the physician is willing to study each individual patient and fit the drugs to the patient, not the patient to the drugs.

FIRST NATIONAL BANK BUILDING

REPORT OF TWO CASES OF GRANULOSAL CELL TUMORS OF THE OVARY

E. F. DAILY, M.D., CHICAGO, ILL.

(From the Department of Obstetrics and Gynecology, The University of Chicago)

THE infrequency of occurrence of this type of tumor warrants the report of the following 2 cases; only 7 cases have been reported in this country, and only about 150 appear in the entire literature.

CASE 1.—Mrs. H. L., No. 49340, aged thirty-eight, para vi, gravida ix (three intentional abortions). Menopause began six years ago (aged thirty-two), following the last abortion. There was no bleeding or spotting since that time. No operations were performed. The patient was first seen in November, 1931, when, during a general physical examination, slight adnexal enlargement was felt, and a diagnosis of probable chronic bilateral salpingo-oophoritis was made. As the patient had no pelvic complaints, no operative interference was thought to be indicated. On return visits, enlargement of the left ovary was noted, and, in August, 1932, it was thought to be about 7 cm. in diameter and felt quite hard. A diagnosis of solid tumor

of the left ovary was made and a bilateral salpingo-oophorectomy and total hysterectomy were done. The postoperative convalescence was uneventful.

Gross Description of Specimen.—The uterus measured 7 by 4½ by 3 cm. Its surface was smooth, and the cervix was moderately eroded, with a bilateral lacera-

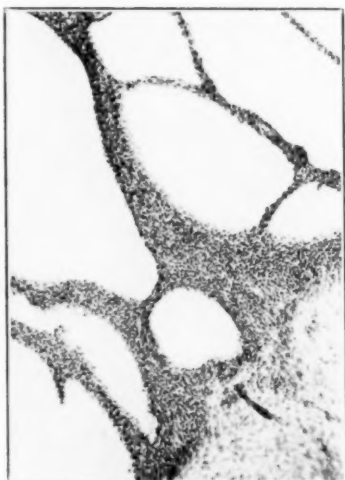


Fig. 1.

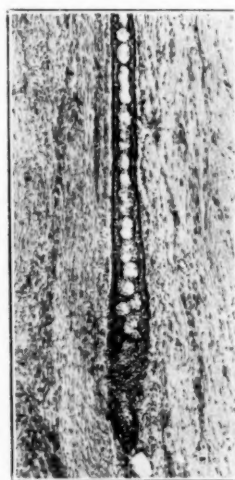


Fig. 2.

Fig. 1.—Multiple cysts with walls of solid granulosa-like cells. ($\times 120$)

Fig. 2.—Invasion of dense fibrotic tissue by granulosa cells, showing numerous follicle-like structures. ($\times 120$)

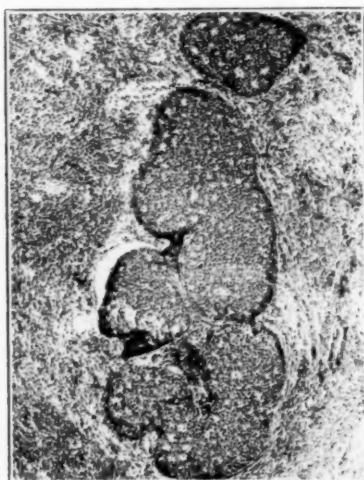


Fig. 3.

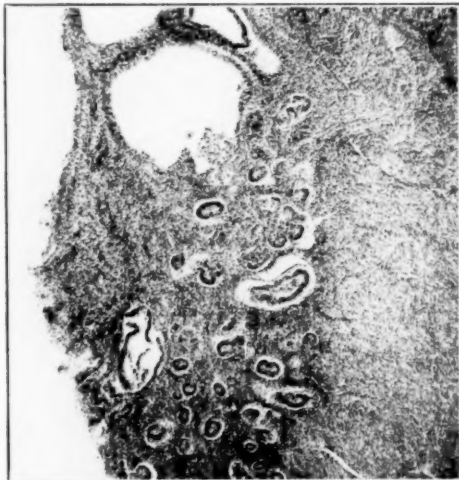


Fig. 4.

Fig. 3.—Typical island of granulosa cells. ($\times 120$)

Fig. 4.—Endometrium showing variations in size of glands and hyperplasia. ($\times 60$)

tion. The right tube and ovary were attached to the uterus and appeared entirely normal externally and on cut section. The uterine cavity was 5 cm. in length, with uniform walls. The endometrium was not over 2 mm. in thickness at any point. The left ovary was round, measuring 7 cm. in diameter, and of firm consistency, the outer pole being almost cartilaginous. The tube was adherent to one surface, but

was otherwise normal. On cut section, the ovary was found to be divided into two portions, the larger of which occupied two-thirds of its substance. It was made up of a dusky yellow material, about the consistency of gelatin, and contained numerous small cyst cavities. The smaller portion, or the remaining one-third, was composed of very hard white fibrous tissue, with occasional small cysts which contained clear serous fluid.

Microscopic Description.—The sections of the ovary were largely composed of cells resembling granulosa cells. They were closely packed together, with very little stroma. Throughout all of the masses of these cells a tendency to form small circular structures, with a single layer of cells resembling the primordial follicles, was noticed, but no ova were seen. The cyst cavities were mostly lined by multiple layers of these same cells, and, throughout the cortex of the ovary, small groups of cells, closely packed together, were frequent. The staining of these cells in the smaller groups was much darker than of the same cells in the large mass. Several cells containing mitotic figures were seen in every high power field. At one pole of the ovary was an area of dense fibrotic connective tissue, containing occasional

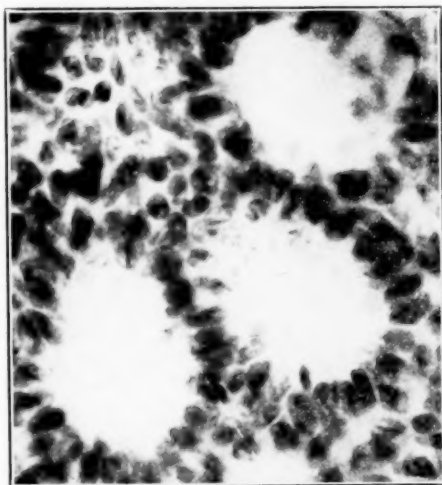


Fig. 5.

Fig. 5.—High power of any area in Fig. 3. Note single layer of cells forming follicle structure. No ova are seen. ($\times 1225$)

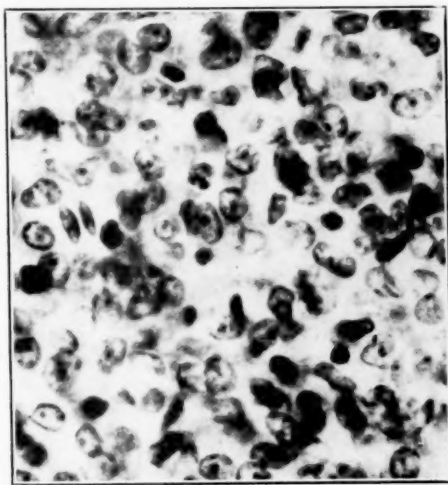


Fig. 6.

Fig. 6.—High power of solid mass of granulosa cells, occasional mitotic figures. ($\times 1225$)

small structures resembling follicles, larger areas of granulosa-like cells invading the stroma, and small cysts, lined by multiple layers of the same cells. (There were no unusual findings in the right ovary.)

The endometrium contained glands varying greatly in size as some were considerably enlarged and cystic, but there was no hyperplasia of glands or cells and the cytogenic stroma and myometrium were normal.

CASE 2.—Mrs. T. L., No. 79258, aged twenty-seven, para ii, gravida ii. Menses began at the age of twelve and were regular until after the birth of her second baby, which was sixteen months prior to her present admission to the hospital. The patient gave a history of amenorrhea for the past sixteen months. Pelvic examination revealed an old deep perineal laceration, second degree rectocele and cystocele, and a deeply lacerated and eroded cervix prolapsed to the introitus. The corpus uteri was normal in size, but retroverted. The right adnexa were negative but there

was a left adnexal tumor of firm consistency and about 7 cm. in diameter. The tumor was diagnosed as probably a granulosa cell tumor because of the menstrual history and a unilateral solid ovarian tumor. The Aschheim-Zondek reaction was weakly positive.

At operation the tumor was found to be entirely free and the opposite adnexa negative. A left salpingo-oophorectomy, uterine suspension, trachelorrhaphy and anterior and posterior colporrhaphy were done. The postoperative convalescence was uneventful and the patient left the hospital on the twelfth day.

Pathologic report: The left ovary was 7 cm. in diameter. The serosa was smooth with marked capillary congestion. Cut section through the ovary showed it to be made up, partially, of small multilocular cysts, filled with a clear light yellow fluid, and, partially, of a granular soft yellow substance, which completely filled the locules.

Microscopic sections revealed practically the identical structures and cellular arrangement as described in Case 1, i.e., tubules, solid masses and numerous cysts lined with granulosa cells.

AN INTERNAL OUTLET PELVIMETER

SAMUEL HANSON, A.M., M.D., STOCKTON, CALIF.

(From the San Joaquin General Hospital)

IN A PREVIOUS communication¹ I presented a pelvimeter for the measurement of the bispinous diameter. Recently I found that the same instrument can also be used for the measurement of the bischial, posterior sagittal, anterior sagittal, and sacropubic diameters.

The bischial diameter is measured in exactly the same manner as is done with Williams' pelvimeter. The rings of the instrument are brought against the ischial tuberosities with the tips of the thumbs placed within them. A reading is made on the scale while firm pressure is being exerted against the tubera. One and five-tenths centimeters are added to the reading for the thickness of the overlying skin and subcutaneous fat. Two hundred measurements taken in this manner gave an average of 10.71 cm.

For the measurement of the posterior sagittal diameter a slight modification of the pelvimeter is required. The convex border of the rectal blade is graduated in 1.0 cm. divisions, making the measurements diagonally from the distal border of the ring (Fig. 1). A crossbar with a notch in its center, of a length to fit exactly between the ischial tuberosities, is also required. An ordinary wooden tongue depressor, cut to the proper length, is very satisfactory for this purpose (Fig. 2).

For the actual measurement the tip of the left index finger is passed into the ring, and the blade resting on the dorsum of the finger is introduced into the rectum. The sacrococcygeal joint is identified by a combined internal and external manipulation, and the ring is placed and held gently against the joint with the tip of the finger. The crossbar is accurately adjusted between the ischial tuberosities with the thumb and index finger of the other hand. The blade of the pelvimeter is then raised against the notch of the crossbar and a reading is made on the scale.

The posterior sagittal diameter was measured by the above method in 147 consecutive cases. The average obtained was 8.62 cm. For comparison the diameter was also taken in the same cases externally with a Breisky pelvimeter. This measurement was made from the sacrococcygeal joint externally to the midpoint on a crossbar held by an assistant between the ischial tuberosities; 1.0 cm. was deducted for the thickness of the sacrum. The average for this series of measurements was 8.58

cm. The averages obtained by the two methods were thus practically identical. Considerable individual differences were, however, frequently encountered. These differences amounted to as much as 1.5 cm. or more in 26 instances. The discrepancies usually occurred in the cases in which it was difficult to find the sacrococcygeal joint.

The anterior sagittal diameter is obtained by placing the ring of the rectal blade against the inferior border of the symphysis pubis; the ring being held between the thumb and index finger of the left hand. The crossbar is accurately adjusted between the ischial tuberosities, and the reading is made as in the measurement of the posterior sagittal diameter. The average of 160 consecutive measurements taken in this manner was 6.33 cm.

Direct internal measurements of the sacropubic diameter can be made with the vaginal blade attached to the rectal blade in a reversed position. A slight modifica-



Fig. 1.

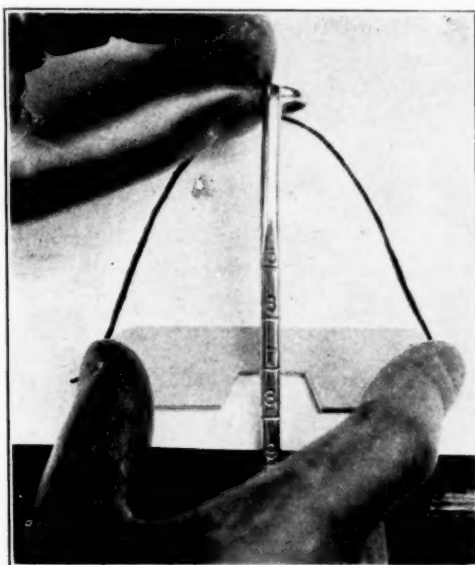


Fig. 2.

Fig. 1.—A, Lateral view of rectal blade, showing graduations. B, Crossbar.
Fig. 2.—Measurement of the anterior sagittal diameter.

tion of the original instrument is required to obtain readings with the vaginal blade in the new position. This consists of a scale fixed to the rectal blade on the opposite side and symmetrical to the one provided for the measurement of the bispinous diameter (Fig. 3). This scale is graduated so as to represent the distance between the lower borders of the rings, with the vaginal blade reversed (Fig. 4).

To obtain the measurement, the rectal blade is introduced into the rectum and its ring steadied against the sacrococcygeal joint, as in the taking of the posterior sagittal diameter. The vaginal blade is adjusted as indicated (Fig. 4), and the lower border of its ring, held between the thumb and index finger of the other hand, is brought against the inferior border of the symphysis pubis. A reading is made on the scale while the rings are held in this position.

The sacropubic diameter was measured by this method in 160 consecutive cases. The average obtained was 10.94 cm. For comparison this diameter was also taken in the same cases externally with a Breisky pelvimeter. This measurement was

made from the sacrococcygeal joint externally to the inferior border of the symphysis pubis; 1.0 cm. was deducted for the thickness of the sacrum. The average for this series of determinations was 10.74 cm. As in the case of the posterior sagittal diameter, considerable individual differences were frequently encountered in the two series of measurements. These differences amounted to as much as 1.5 cm. or more in 21 instances.

The above comparative measurements demonstrate clearly the greater accuracy of the method proposed. It was found that the sacrococcygeal joint can be identified more readily, and with greater certainty bimanually, than by external palpation

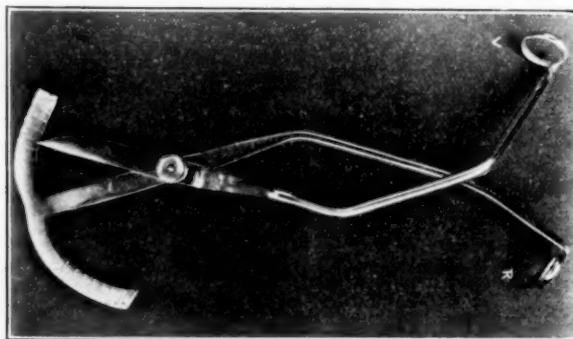


Fig. 3. The internal outlet pelvimeter in its present form, with a new scale on the rectal blade (*R*).

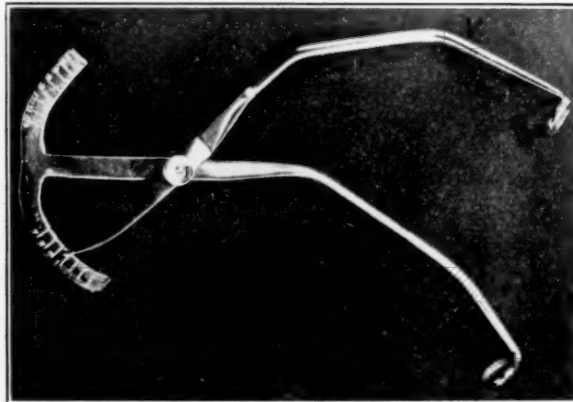


Fig. 4.—Vaginal blade (*V*) reversed for the measurement of the sacropubic diameter.

alone. It was also found that the tip of the sacrum is subject to considerable individual variation in thickness and form. Both of these sources of error are entirely eliminated by the method of direct internal measurement.

For the measurement of the bispinous diameter, the tip of the middle finger of the right hand is inserted into the ring of the vaginal blade (*V*). With the blade in place, the index and middle fingers are introduced into the vagina. The tip of the index finger of the left hand is similarly placed within the ring of the rectal blade (*R*), and is introduced into the rectum. The two blades are now locked, and the spinous processes are identified. The rings are then steadied against the spinous processes, and a reading is made on the scale. There were 1939 measurements taken

by this method. The average value obtained was 10.51 cm. This method was already described in greater detail in a previous communication.¹

All of the above measurements can be made almost painlessly, and without the aid of an assistant. The use of one instrument for the measurement of all the diameters of the outlet, as well as the bispinous diameter, is another distinct practical advantage.

The instrument is made by George Tiemann & Co., 107 East 28th Street, New York.

1009 MEDICO-DENTAL BUILDING

¹Hanson, Samuel: AM. J. OBST. & GYN. 19: 124, 1930.

SELF-RETAINING VAGINAL SPECULUM

G. S. BEARDSLEY, M.D., EUGENE, ORE.

THE responsibility for cancer of the cervix rests almost entirely with the obstetrician. According to numerous authorities over 90 per cent of these cases are the result of neglected birth injury. Thomas E. Jones of Detroit states that, "Since in the final analysis, cancer of the cervix is largely an expression of incomplete maternity service, it becomes obvious that the solution of the problem rests almost wholly in the hands of the obstetrician."



Fig. 1.

Only very rarely does carcinoma develop in the damaged cervix when promptly and properly repaired after childbirth. This means that the cervix should be routinely inspected immediately after delivery, and if laceration is found it should be sutured. However, in the small hospital we often lack the necessary assistants to hold the usual vaginal retractors. To overcome this difficulty I have

devised a three-bladed, self-retaining vaginal speculum which has been properly referred to as a "one-man instrument."

The instrument has several features peculiar to itself. The blades are solid, and relatively wide and short; and when in use completely retract the vaginal walls to afford an unobstructed view of the birth canal, and permit the cervix to be pulled down to the introitus without displacing the instrument. Also it will be noticed that the blades diverge slightly as they extend from the shank; and this feature together with the lipped ends makes the instrument absolutely self-retaining, even after episiotomy. The posterior blade is not weighted, and in repair of a rectocele or in any other situation where it is desirable the instrument may be inverted. The instrument is intended primarily for examination and repair of the cervix immediately postpartum, but could be used in a variety of plastic operations.

It is manufactured by Sharp and Smith, 65 E. Lake St., Chicago, and is called the Beardsley Speculum.

Erratum

In the article entitled "Anatomical Variations in the Female Pelvis and Their Effect in Labor With a Suggested Classification," by W. E. Caldwell, and H. C. Moloy, published in the October issue, attention is called to the following omission:

The three illustrations of skeletal pelvis, i.e., Figs. 8, 9, and 15, on pages 489, 491, and 496, respectively, were obtained from Professor T. Wingate Todd's collection of pelvis of known sex at Western Reserve University and not from the U. S. National Museum. The authors are greatly indebted to Professor Todd and deeply regret this error in acknowledgment of the many courtesies extended. The Western Reserve material represents the largest collection of skeletons of known sex in existence and its scientific value cannot be too highly appreciated by the medical profession.

Society Transactions

AMERICAN GYNECOLOGICAL SOCIETY

FIFTY-EIGHTH ANNUAL MEETING

Washington, D. C.

MAY 8 to 10, 1933

The following papers were read and are published in this JOURNAL, except as noted:

1. **Nephritis and Pregnancy.** Dr. J. R. Goodall, Montreal, Canada. (See page 556, October issue.)

ABSTRACT OF DISCUSSION

DR. E. D. PLASS, IOWA CITY, IOWA.—If one looks upon chronic nephritis as a progressive disease, he must question the pregestational clinical diagnosis. This scepticism is not a reflection upon the clinician but rather a recognition of the inadequacy of our diagnostic methods. It seems incomprehensible that a progressive disease such as chronic nephritis may be improved or cured by pregnancy. If, however, our conception of chronic nephritis as a progressive disease is inaccurate, it is obvious that recoveries of this sort may occasionally occur. There are other pregnancy complications which apparently improve temporarily during gestation, such as diabetes, for example, during the latter months of pregnancy, with no glycosuria and blood sugar at normal levels. But one is certainly not justified in those instances in speaking of cured diabetes, because we know that, during the puerperium, or after lactation, the signs of diabetes reappear.

* * * * *

DR. EDWARD A. SCHUMANN, PHILADELPHIA, PA.—I confess to a considerable degree of confusion after reading Dr. Goodall's paper. My first reaction, I must confess, was one of rather sharp disagreement. However, one may not lightly brush away the considered opinions of a man of Dr. Goodall's accuracy of observation.

I received the impression that he was dealing with two dissociated conditions. If it be true that the conception of Bright and his followers since 1829 is correct with regard to the destructive processes of glomerular nephritis, and the more modern opinions of the degenerative conditions in tubular nephroses which he described, I feel that it is very difficult to trace a connection between the repair or restoration of these pathological destructive processes and the endocrine glands. I cannot as yet reconcile these two conditions.

On the other hand, I have long agreed that the late toxemia of pregnancy, per se, is probably of endocrine origin. The discovery of pituitary extract in the urine of pregnant women, the well-known pressor activity of pituitary extract, makes one believe that somehow as a result of the stimulation of the pregnancy in decidual formation there will be some secondary effect upon the endocrine glands which in certain unbalanced individuals produces toxemia. I have long been opposed to the attempts to discover the etiology of eclampsia and the toxemia of late pregnancy by considering the débris left after the storm.

I would say in conclusion that I still cannot reconcile the restoration of destroyed tissue by the stimulus of the endocrines produced by pregnancy.

*For lack of space, it is not feasible to publish these discussions in full; they may be found complete in the current volume of the Transactions of the Society.

DR. FRED L. ADAIR, CHICAGO, ILL.—So far as my own recognition of similar cases is concerned I will say that it is extremely rare, probably due to the fact that we have in certain cases failed to recognize such a condition. Perhaps we have aborted some of these cases and unjustifiably attributed their improvement to the abortion. However, it would seem to me that possibly his case fits in more closely with what we consider to be a nephrosis rather than a progressive and chronic nephritis. Of course, the preferred treatment for nephrosis now seems to be a high protein diet. We are not going to be very clear about some of these conditions until we are in a better position to recognize the diversity of things which are included among the toxemias of pregnancy and in order to emphasize the diversity of these conditions I would like to present briefly the history of two cases which came to autopsy.

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DR. WILLIAM R. NICHOLSON, PHILADELPHIA, PA.—Twenty-five years ago a patient came to me to determine whether it was possible for her to become pregnant. As she had a blood pressure of 170 and a large amount of albumin, hyaline and granular casts, I strongly advised against it. Two years later she came back, was pregnant about two months, and insisted upon going on. Today she would have been evacuated at once because of her symptoms and it would have been recorded as a life saved. She had her baby by induced labor, three weeks before term. That baby is now a grown woman of 25. She has had the pleasure of her child for 25 years and until very recently she has had absolutely no symptoms and no difficulty except that she was under par and could not do many things that the ordinary woman does. She has continued to have albumin almost constantly, although it occasionally disappears. The blood pressure has remained consistently high. About a year ago she had a thrombosis from which she has entirely recovered.

DR. GOODALL (closing).—I do not believe these cases are cured permanently but they are tremendously improved. Permanency will depend upon the stability of the gland afterward. I have very little doubt that after many years some of them will develop nephritis. But what I want to emphasize particularly is this: that our clinical methods for the diagnosis of nephritis are thoroughly inadequate. I asked the internist, who worked the case out, whether he could diagnose an advanced functional disturbance of the kidney from one where there has been definite organic disease. He replied that he could not except in a small percentage of cases where there is a light dysfunction on the one side and a very advanced functional disease on the other.

The next question I asked was, How long can a dysfunction, such as the endocrine condition here producing a renal lesion, persist before organic disease appears? The internist said that it depends entirely upon the intensity of the condition and the instability of the renal system.

Dr. Schumann said that he could not attribute this condition to the endocrine dysfunction. Neither can I. I tried to emphasize that the organic trouble that exists in these cases is not due to endocrine disturbance, but to the metabolic changes. This change throughout the system we recognize in the advanced cases as the after-effects of advanced organic disease.

I want to emphasize that the pressor substance acts in the blood of one fetus independently of the water retention substance, just as in thyroid we may have exophthalmos in one case and in another case very marked cardiac trouble. Also in pituitary cases we may have only the pressor substance present and no edema,

and in other cases there may be the water retention substance with edema, extravasation into the lymph and tissue channels, and like changes.

As to the rarity of these cases I am not prepared to answer. The fact that I have been able to study five cases in the period of several years shows that the condition must be relatively common. There are cases which should be submitted to a careful blood chemistry examination before it is decided whether the woman is capable of bearing a child.

2. An Analysis of a Series of Nonconvulsive Cases of Toxemias of Pregnancy.

Dr. Fred L. Adair, Chicago, Ill. (See page 530, October issue.)

Comparative Studies of the Blood in the Nonconvulsive Toxemias of Pregnancy. Dr. William J. Dieckman, Chicago, Ill. (by invitation). (See page 543, October issue.)

DISCUSSION

DR. H. J. STANDER, NEW YORK CITY.—I would like to stress the importance of repeated tests in blood chemistry. A single kidney function test is of no value. We see so many papers written and chemical studies done purely on a single determination. It is repeatedly seen that if several tests are made it will be possible to establish a level which is far below normal.

I cannot quite agree with some of Dr. Dieckmann's findings. He has shown that the nonprotein nitrogen is elevated in his eclamptic patients. This is elevated but only late in eclampsia. I think that is one of the differentiating points, to show that eclampsia has virtually nothing to do with nephritis. The first day or two it will be found that the level is usually normal. In the third or fourth day it may go to 30 or 60, or even as high as 70 mg. per hundred c.c., of blood and it will subsequently return to normal. I think that is due to the effect that the eclampsia may have on the kidney. In the earlier cases reported it was usually given as quite high.

In the CO_2 combining power there is a drop in cases of eclampsia, the normal value in pregnancy being about 45 volumes per cent.

In the differentiation of cases into preeclampsia and nephritis, I agree with Dr. Dieckmann but I would like to go one step further in his nephritic group. There is one group which certainly is not nephritic, cases which may show a slight hypertension and a slight albuminuria that will go through the pregnancy normally and then come back with a second or third pregnancy without nephritis or toxemia. We have called that group low reserve kidney. Kellogg calls it recurrent toxemia of pregnancy. I feel quite strongly that it is not nephritic and it certainly is not preeclamptic.

DR. JOHN M. BERGLAND, BALTIMORE, MARYLAND (by invitation).—It seems to me that experience with the usual chemical and laboratory tests gives us very little important information as to the toxemias of pregnancy. On the other hand, I believe that a careful study of the patients before pregnancy with regard to a possible history of infectious diseases during pregnancy and in the months thereafter, often gives us a clear picture of the true condition. After all, I feel that the whole clinical outlook of the patient depends on the amount of kidney damage which has been sustained, and this cannot be determined often until a number of months have elapsed or even until the patient has a subsequent pregnancy. Sometimes we have been correct in our diagnosis, at other times, not. It is perfectly true, as Dr. Goodall says, that occasionally a patient may go through pregnancy, have a safe if premature delivery, and a good baby in spite of the fact that the situation looked very dark at the onset. I do not think, however, that such a case proves that there is a permanent improvement in the chronic nephritis. The kidneys

certainly are not improved. However, I do agree that a patient should be given the opportunity to have a pregnancy and continue in it if she is well acquainted with the possible risk that she runs in so doing.

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DR. J. HOFBAUER, BALTIMORE, MARYLAND.—Harvey Cushing has demonstrated the massive invasion of the neurohypophysis by basophilic cells in eclamptics, which was interpreted by him as new evidence in support of the work done at Hopkins which culminated in the demonstration that both the clinical symptoms and the biochemical-anatomic features of eclampsia can be validly explained in terms of posterior hyperpituitarism.

Dieckmann's studies likewise support our conception. Pituitary extract, in experimental animals, produces an increase of the specific gravity and coagulability of the blood, an increase of the red blood count and hemoglobin. Under the stimulus of pituitary extract, the spleen vigorously contracts and forces showers of red blood cells from its large blood sinuses into the blood stream. In man, under such conditions, an increase up to 24 per cent was recorded.

Furthermore, Barbour quite recently reported loss of plasma of the blood following the administration of pituitrin.

Our work stresses the importance of the liver as an important agent, along with the capillaries, in destroying pituitary hormones. A diminution of the protective function of these structures during the second half of pregnancy, as demonstrated by several investigators, might readily result in a rapidly increasing concentration of pituitary and thyroid principles in the blood. This may be conducive to the development of toxic effects upon vital organs and metabolic processes, with arteriolar spasms, derangement of water economy and of inner oxydation (anoxemia) as its main features. Ultraviolet rays and alkali destroy postpituitary hormones. These agents may be used to advantage in eclamptics and preeclamptics.

DR. ADAIR (closing).—From a clinical as well as from a laboratory point of view we should recognize two general groups in this rather confused state of affairs regarding toxemia. *First, the group* very definitely associated with pregnancy, namely the preeclampsia and eclampsia which, I believe, differ in degree rather than in character. *The second group*, cases definitely aggravated by pregnancy but do not seem to be caused by pregnancy. One such affection seems to be where the pathology is of the vascular type, characterized by essential hypertension, which ultimately leads to kidney damage of the vascular tree with arteriolar sclerosis of the kidney. Another type is where the condition seems to be primarily renal and is typified by a number of different conditions which it is not necessary to detail at this time.

In order to check the accuracy of our clinical diagnosis Dr. Dieckmann and I went through these records independently, attempting to place clinical diagnoses. We only took the cases where we thought there was sufficient chemical data to make the diagnosis from a laboratory point of view.

In this group of nonconvulsive cases on which laboratory work was done, I selected 39 with a diagnosis of hypertension. Dr. Dieckmann had sufficient laboratory data on 22 of these to make a diagnosis from his point of view. He agreed with the clinical diagnosis in 21 of the 22. The laboratory diagnosis checked in 20 of these cases.

I selected a group of 55 where a diagnosis of preeclampsia seemed justified from a clinical point of view. Twenty-one of these cases had sufficient laboratory work for a diagnosis from a chemical point of view. The results in this series were not very satisfactory, as the laboratory diagnosis coincided with the clinical diagnosis in only 10 of the 21.

It is obvious that we have no clearly cut method, either clinical or laboratory, of differentiating the different types of conditions included under the generic name of "toxemias of pregnancy."

DR. DIECKMANN (closing).—Dr. Stander stated that the figures given for the nonprotein nitrogen in eclampsia were too high and that there is no kidney damage early in the disease. I agree with this statement and wish to point out that the increase in nonprotein nitrogen early in the disease is due to the oliguria or suppression of urine, and the nonprotein nitrogen will vary directly with the period of oliguria.

As to the low reserve kidney, I believe these patients all belong to the group of nephritic toxemia and differ only in degree. The fact that in successive pregnancies none of the symptoms or signs increase in severity is due to the prenatal care given. Proper diet, meaning a low acid residue, sufficient protein to maintain a normal balance, proper bowel elimination, rest, etc., will certainly reduce the work on the part of the kidney and circulatory system as a whole, although the patient has the disease, which *apparently* does not increase in severity.

Dr. Schumann asked how we differentiate between the renal and vascular types of toxemia. That is just as difficult for us as for anyone. I place them in one group. If the patient is young and the renal function test, which must be repeated a number of times because there are marked variations in these tests, shows a normal kidney, and particularly if the Addis count shows no marked increase in cells, I consider the condition as an essential hypertension in pregnancy. However, I would like to point out that so far as we, as obstetricians, are concerned, it does not make any difference in the end-result whether you decrease the kidney function by destroying the glomerular membrane or by an arteriolar lesion of the efferent artery.

3. The Treatment of Prolapsus Uteri, With Special Reference to the Results Obtained by the Manchester Operation. Dr. William Fletcher Shaw, Manchester, England (by invitation). (See page 667.)

DISCUSSION

DR. GEORGE GRAY WARD, NEW YORK CITY.—Our results may vary from Dr. Shaw's because of the difference in our follow-up methods. As I understand it, the follow-up, carried out on this large series of cases, is very often by letters and statements from second parties, whenever the patient cannot be seen. The follow-up we have on our own cases in the Woman's Hospital, New York, is a personal follow-up. We think that it takes the conceit out of a good many of us when we see our results with our own eyes. Many times the patient will be symptom-free but the result is not always as ideal as one would like.

We agree as to the fundamental trouble in prolapse being due to the overstretching or elongation of the supports of the uterus. The base of the broad ligaments and the uterosacral ligaments are overstretched, and an obstetric injury to the fascial supports is a predisposing factor. I take it that some of the cases included in this very large series may have had cystoceles rather than extensive prolapse of the uterus.

The principle involved in this operation which Dr. Shaw advocates is essentially the same that we have all been following. I have seen this operation done in Manchester by Fothergill so that I am aware of the technic employed there. We simply hook the cardinal ligaments on either side of the cervix together in front of the cervix, thus reefing them, which elevates the uterus and pushes the cervix back. This method was brought out by Alexandrof in Germany in 1906. The Emmet-Baldwin operation accomplishes the same thing. Reynolds of Boston also advocated a procedure many years ago which is not dissimilar. In our service, in the child-bearing cases the procedure advocated by Dr. Shaw gives us a very satisfactory

result. But in the nonchildbearing woman we frequently do not adopt that method because at the Woman's Hospital, we find that there is quite a large percentage of these cases who have diseased uteri, or are complicated by myoma and an hypertrophied cervix, or adnexal disease. We have found that nearly 80 per cent of cases of that type occur in these elderly women and therefore we have felt that it is better to get rid of these diseased organs on that account. If the uterus is not diseased, the interposition operation is often adopted.

With the Manchester operation I cannot quite see how one can prevent enterocele where there is a big Douglas' pouch.

I think it is most important that we should not have one type of operation for all cases, but should individualize our cases and use the operation that is best suited to each.

DR. FRANK W. LYNCH, SAN FRANCISCO, CALIFORNIA.—It is very interesting indeed to review the history of the operation described by Shaw. Most of us have felt that this operation was introduced by the Germans; it was used by Schroeder, later by Alexandrof; it was popularized by Ries when he first came to this country. We have all been doing this same general type of operation with excellent results, with a small mortality, by a technic which I have been astonished to find was developed by Donald in Manchester nearly as many years ago as this Society is old.

DR. SHAW (closing).—I am not bringing this operation forward as of my own devising, nor as showing better results in my hands than in the hands of any one of my colleagues. I do want to show that this operation has been performed for a continuous period of forty-five years in one center by practically every member of the staff, and that we are getting results which show as nearly as possible a cure in all cases.

Unfortunately, my Chief, Dr. Donald, seldom bothers about writing. The result is that he was content to perform this operation so that his pupils and guests might watch him and carry the operations to various parts of the world. It was not until many years afterward that he wrote anything about it. Later Fothergill brought it into prominence. He learned the operation, of course, from Donald but he did a large amount of good by publishing it afterward. In 1888, he was actually using catgut brought from Germany for the purpose. He used it for the deep suturing of the muscle and taught us how to rely on this type of suturing as the most important part of the operation. When I became his house surgeon in 1904, it was an established, recognized operation which every member of the staff was performing. We have used it continuously since.

Dr. Ward quite rightly says that probably everybody in this country is using the same operation and getting equally good results. But what I cannot understand is why one should bother to use any other operation for particular groups of cases. We get just as good results in old women as in young and in nulliparous as in parous women. Then why bother to perfect the technic of any other operation? Our operation takes twenty to thirty minutes and there is an enormous difference in time when we are dealing with old patients.

4. Granulosa Cell Ovarian Tumors as a Cause of Precocious Puberty, With a Report of Three Cases. Dr. Emil Novak, Baltimore, Maryland. (See page 505, October issue.)

DISCUSSION

DR. HOWARD C. TAYLOR, JR., NEW YORK CITY (by invitation).—The demonstrations of tumor function promise to contribute greatly to the more accurate classification of ovarian tumors. Such a new aid to diagnosis is especially necessary

in the granulosa cell group, where the morphologic limits within which the term may be used are, I believe, somewhat ill defined. The difficulty of reaching a positive diagnosis upon purely morphologic grounds was impressed upon me during a review, which I undertook for this discussion, of 112 cases of malignant ovarian tumor in the files of the Roosevelt Hospital laboratory. Of these cases there was one which had already been reported as a granulosa cell tumor in 1929. There were four more in which the diagnosis was probable and no less than eleven in which with a proper bias, the diagnosis of granulosa cell tumor might have been made. Particularly in the case of advanced tumors made up of cells growing diffusely or in the so-called cylindromatous form, the possibility of confusion with other undifferentiated growths seems to me to be very real. In this type the presence or absence of signs of functional activity may be a decisive factor in diagnosis.

The histologic form in Dr. Novak's cases as well as the corroborating evidence afforded by the development of the secondary sex characteristics give them a special claim to consideration as proved examples of the granulosa cell tumor and they should serve as standards upon which the diagnosis of future cases may be based.

It must be remembered, however, that the striking effects of the granulosa cell tumor on the endometrium and in the secondary sex characteristics are not entirely specific and are found in association with other ovarian neoplasms. The development of precocious puberty has in the past usually been reported with ovarian sarcoma or embryonal carcinoma, but, if these cases could be reviewed, many might prove, as Dr. Novak has pointed out, to be granulosa cell tumors.

There seems, however, to be at least one other distinct group of ovarian tumors which is connected with premature puberty. These occur in different forms but are all apparently teratoid in origin. One such case has been reported by Dr. Frank in which derivatives of all three germ layers were present. To this group may belong also the primary chorioepithelioma of the ovary of which three samples in children have been reported in the last two years. Of these the case of Siegmund—an instance of precocious puberty in a girl of six, is the most remarkable. The urine from this patient contained over 30,000 units of anterior hypophyseal hormone per liter and fragments of the tumor tissue also showed the presence of considerable quantities of this hormone. In interesting contrast with the supposed behavior of the granulosa cell tumors was the absence of any large quantity of follicular hormone in the urine of Siegmund's patient. On account of these cases, I wonder if Dr. Novak is justified in yet assuming that the granulosa cell tumor is the usual ovarian growth causing precocious puberty.

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In conclusion I wish to raise the very practical question of the proper treatment of a case of precocious puberty in the absence of a demonstrable tumor. In the case reported by Siegmund, to which I referred, signs of mammary development were present several months before any tumor was discovered and this delay in operation may have contributed to the child's death from metastases. A child of two years and two months with definite breast enlargement is now under my observation in the Memorial Hospital Breast Clinic. No tumor in the pelvis is palpable but examination of the urine has shown the presence of 500 units of prolactin per liter and a trace of female sex hormone amounting to possibly 10 units per liter. The present plan is to examine the patient monthly in the hope of detecting as early as possible, any developing tumor. The case illustrates a rare but very real problem.

DR. OTTO H. SCHWARZ, ST. LOUIS, MO.—I wish to call attention to a case of precocious menstruation that has been observed recently by Drs. C. D. O'Keefe and R. J. Crossen in St. Louis. The patient, who is now twelve years of age, began menstruating at four and one-half years. She was irregular until nine years of

age, and for the past three years has been fairly regular and the flow quite profuse sometimes extending over a period of ten to twelve days.

The patient has been thoroughly studied, and no definite cause as to this abnormal function has been found. The adrenals, pituitary and ovaries have been practically ruled out. From the x-ray, there is marked intracranial pressure present, as shown by the definite convolution atrophy of the bones of the skull. There is premature closing of all epiphyses. The blood chemistry was entirely negative, except for a high blood calcium. It is suggested that we are dealing with a pineal tumor with a resulting hypopinealism.

DR. NOVAK (closing).—I agree with Dr. Taylor that one cannot too casually assume the granulosa cell nature of ovarian tumors which may be present in cases of precocious puberty. I have stressed this point in my paper, citing a case of my own, as well as others from the literature, in which no ovarian tumor of any kind was present. Nevertheless, when an ovarian tumor coexists with this syndrome, it is most likely to be of the granulosa cell variety. There is no doubt that many cases described in the older literature as sarcomata really belong to this family of tumors.

The second case which Dr. Taylor described, one of precocious puberty, and which he feels is so doubtful, I would unhesitatingly diagnose as a typical granulosa cell tumor of the sarcoma-like variety. Many histological patterns are encountered in these tumors, and numerous blocks and sections should be taken. Through the kindness of Dr. Samuel Wolfe, of Brooklyn, I recently examined a slide which in most places was a typical round cell sarcoma, but which in one segment presented a very frank granulosa cell picture. The folliculomatous type is the least common, while the cylindromatous is very frequent and very distinctive.

Dr. Schwarz's case, like my own Case 4, belongs to the group in which no tumor has been discoverable, and it is quite possible that in neither of them will a neoplasm ever crystallize out. In these patients, the forces of puberty are, for some unknown reason, released abnormally early, so that the patient merely skips her childhood. In my own patient the histological examination of the ovary showed that ovulation had been taking place, so that impregnation was theoretically possible if insemination had occurred. The remarkable cases of precocious pregnancy reported in the literature must likewise have been associated with ovulation, so that they can scarcely be explained on the basis of granulosa cell tumors. My incentive in this paper has been to call attention to these biologically interesting tumors, and to their characteristic association, when they occur in children, with the syndrome of precocious puberty.

5. Prevention of Cancer of Cervix Uteri. Dr. Harry S. Crossen, St. Louis, Mo. (See page 686.)

6. Radiation Therapy in Carcinoma of the Corpus Uteri. Dr. William P. Healy, New York City. (To appear in a subsequent issue.)

7. Coincident Surgical Exposure and Radium Therapy in the Treatment of Extensive Cervical Cancer. Dr. Arthur H. Curtis, Chicago, Ill. (See page 569, October issue.)

8. Advanced Carcinoma of the Cervix, With a Report of 166 Necropsies. Dr. Charles A. Behney, Philadelphia, Pa. (by invitation). (See page 608, October issue.)

DISCUSSION

DR. FRANK A. PEMBERTON, BOSTON, MASS.—I agree that the crux of the situation is early diagnosis and that can be attained only by the regular examina-

tion of women, especially those who have borne children. I believe one is wise to concentrate on the ages from thirty-five to fifty-five. A year is the best period of time to choose between examinations. Cancer of the cervix probably runs its course if not treated in about two years in the majority of cases so that examination every six months would be better but patients balk at such frequent visits. It is my experience that they are glad to come regularly if the reason is explained to them and that they are not alarmed by the explanation. I find that they like to be sent for by the physician at regular times so that they may dismiss the subject from their minds during the interval.

The next important point is the cure of chronic cervicitis. There are several methods to adapt to the various types of patient. We have found that among 1087 patients who had repair of the cervix at the Free Hospital for Women between 1880 and 1920, 23 cases of cancer of the cervix appeared in from five to thirty-six years after the repair. That is 2.1 per cent developed cancer. Nineteen had no intervening pregnancy. It may be that more radical measures in treatment are advisable.

The third point is the very difficult problem of what constitutes the microscopic picture of early cancer of the cervix. Some definite criteria must be formulated for there is no agreement at present among pathologists. Repair processes are so common in the cervix and so easily confused with early carcinoma and vice versa that many cases of cancer probably are missed and many are diagnosed as cancer which should not be. It is our opinion that a pathologist must have an extensive experience in the examination of sections of cervical tissue in order to be able to differentiate the two conditions.

DR. CHARLES C. NORRIS, PHILADELPHIA, PA.—I believe that Dr. Crossen has rather underestimated the ultimate mortality from carcinoma of the cervix. Statistics from the best clinics show a five-year mortality of from 70 to 75 per cent. From the country at large the mortality is undoubtedly larger, probably in the neighborhood of 85 or even 90 per cent.

Carcinoma of the cervix is usually a painless and insidious disease until moderately advanced. About 80 to 85 per cent of cases of cervical carcinoma occur in multipara. The chronic inflammatory lesions which develop in almost all badly lacerated cervixes are generally concluded to be a predisposing factor to the development of this tumor. Eradication of the cervicitis prior to the cancer age would seem to be an efficient method of preventing the development of this disease. Numerous studies have been undertaken with a view to determining the efficiency of this treatment. The combined statistics of Pemberton, Graves, Smith and Bland, as quoted by Saltzstein and Topek, show that among 18,562 patients adequately treated for the predisposing lesion, 15 subsequently developed cancers, or in other words only one in every 1,247 patients so treated for chronic cervical lesions later developed carcinoma of this region. Studied in another way the same investigators found that among 2,250 cases of carcinoma of the cervix, only 33 or approximately 1.5 per cent had received adequate prophylactic treatment. It is, therefore, apparent if it were possible to eradicate the cervicitis which is often present in multipara the chances of carcinoma developing would be greatly diminished and the frequency of the disease markedly decreased.

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DR. FRANK W. LYNCH, SAN FRANCISCO, CALIFORNIA.—The etiology of the exciting cause of cancer is a preexisting inflammation. Sometimes we lose sight of the fact that even virgins may have preexisting inflammation and in a study of the frequency of cancer in multiparous women I have found by looking over the work

of Gray and West a total of 1,500 cases with an average of 15 per cent of cancers in nulliparous women. According to the United States Census, 30 per cent of women in the cancer age were unmarried and 7.5 per cent of women in the same census had been married for more than a decade and had not been pregnant. And so, roughly speaking, this 15 per cent of unmarried or nulliparous women in this country represents 15 per cent of the cancer incidence, whereas the multiparous women represent 85 per cent.

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DR. CURTIS F. BURNAM, BALTIMORE, MARYLAND.—I am thoroughly in sympathy with the aims and with the plans of Dr. Crossen. My belief, however, is that by such methods there can be only a moderate gain in cure rates and only a moderate increase in the discovery of early cases. It must be remembered that precancerous lesions are difficult to recognize and that the methods we employ in treating erosions, tears, leucoplakias, etc., are as yet untested so far as their value in affording immunity from cancer is concerned.

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DR. EDWARD H. RICHARDSON, BALTIMORE, MARYLAND.—It was my intention to contribute a brief report on similar autopsy material to Dr. Behney's from the Johns Hopkins Clinic. I progressed far enough to see that the findings in all essential respects do not differ materially either from those just reported by Dr. Behney or from those recently published by Warren from several Boston hospitals.

The clinical features of Dr. Behney's report—including age incidence, initial symptoms, tragedy of therapeutic delay, complications, duration of life and causes of death—confirm the experiences of clinics everywhere.

Attention should be focused particularly, however, upon several significant points brought out with regard to radiation therapy. First, its value as a palliative measure in advanced cases both in prolongation of life and in diminution of suffering. But I was surprised to learn that in the decades from 50 to 70 radiation appears to hasten the end. Second, the comforting observation that radiation properly applied does not increase the incidence of ureteral obstruction. Third, metastases beyond the pelvis occurred in 41 per cent of the untreated patients but in only 23 per cent of those radiated. Fourth, autopsy determination of the location and prevailing sequence of metastases should prove to be of distinct value to the roentgenologist in guiding his therapeutic efforts outside the pelvis.

I am a bit perplexed over the fact that while these statistics clearly confirm the prevailing view that the more anaplastic tumors exhibit a greater tendency to metastasize and are also relatively more radiosensitive, they are at variance with the generally accepted belief in that they failed to disclose a definite relationship between prevailing type of tumor cell and duration of life.

DR. GEORGE GRAY WARD, NEW YORK CITY.—Our results at the Woman's Hospital in carcinoma of the fundus are as follows: From 1918 to 1927, inclusive, we have had a five-year observation on 57 cases of adenocarcinoma of the fundus uteri. One case was lost in the follow-up; four cases were discharged without treatment because they were too advanced; and there were 29 cases living five years. There was an absolute cure rate of all cases of 50.8 per cent; a relative cure rate of 54.7 per cent. Cases treated with radium alone, due to the fact that they were poor surgical risks, having cardiovascular disease, diabetes, etc., amounted to 36. Of these 17 lived five years or over, a percentage of 47.2. Cases treated with radium and surgery, that is following the initial diagnostic curettage and application of radium at that sitting, some weeks later removing the uterus by panhyster-

ectomy, totaled 15. Ten of these were living five years, or 66.6 per cent. Of the early cases treated with operation alone, not receiving radium, there were two and they both lived five years, a percentage of 100.

We had 14 women, who had died of carcinoma, upon whom we performed autopsies, with the following findings: urinary system involved in five cases; distant metastases in six; intestinal obstruction in three; and diffuse peritonitis in six cases.

The causes of death were shock from an operation for intestinal obstruction in one case; peritonitis in six cases; pneumonia in two; carcinoma in three; cerebral hemorrhage in one; intestinal obstruction in one; and uremia in one.

DR. FRED L. ADAIR, CHICAGO, ILL.—It has seemed to me that in some of these cases we are dealing not solely with cancer, but with the cancer individual; in other words, with people who have a predisposition toward the development of cancer. I think one reason why that is not obvious is that in the vast majority of cases the person dies from the primary cancer. One sees occasionally cases in which cancer develops in different portions of the body, and not only in unrelated portions of the body, and significantly the cancer is of a different type.

It seems only fair in considering the prevention of cancer to consider the possibility of prevention by hereditary means. A certain amount of statistical data informs us that there is a hereditary predisposition to cancer. Another point is that there is very definite biological evidence that cancer is hereditary. Perhaps the reason we do not see more of these cases in the human being is that very likely the individuals who have the least resistance to cancer from an hereditary point of view are the ones that most frequently die from the primary cancer.

I realize fully the difficulty of hereditary problems. But frequently a doctor is consulted by individuals contemplating marriage and I think one would be willing to say that if they both had a cancer ancestry it might be well for them to reconsider their marital plans. On the other hand, of course, cancer usually develops late in life and these individuals have had an opportunity to lead quite a long and useful life before they die with cancer.

DR. CROSSEN (closing).—For some years I have followed with a great deal of interest Dr. Healy's work with cancer of the corpus uteri, and with a great deal of encouragement to myself. I have had to let patients go without operation, because they could not be operated upon, depending on radium instead. In these cases I depended on irradiation with a great deal of uncertainty and trepidation, but the results were encouraging. Then Dr. Healy came along with much more encouragement and now I do not feel nearly so bad when I have to tell a patient that we must use radium instead of operation. The results obtained in these cases with the combination of radium and x-ray have been so good that I now employ irradiation in all except the first-class operative risks.

DR. HEALY (closing).—I would like to emphasize the fact that 97 per cent of the cases of adenoma malignum were cured by hysterectomy, and only 50 per cent of the adenocarcinoma cases were cured by that operation. We did not have a single mortality in our hysterectomies, practically all of which were done six weeks after radiation. We had 73 hysterectomies in this group without a death and, of course, no mortality from radiation, 134 cases, whose age average was in the sixth decade of life without a death.

Dr. Ward's communication verified exactly that we have been having about 50 per cent of five-year cures in cancer of the corpus treated by hysterectomy and that made us believe that we were curing all of the cases. However, all of these do not live. You cannot get much more than 50 per cent of five-year cures in cancer of the corpus by hysterectomy alone and I want to emphasize again the importance

of bearing in mind that adenocarcinoma of the corpus is going out of the hysterectomy class into the radiation class; and, on the other hand, if you feel that it is such a favorable case for operation that you must do a hysterectomy, then the patient should be given the benefit of preoperative irradiation both within the uterus with radium and around the entire pelvic cavity with roentgen rays.

DR. BEHNEY (closing).—In view of Dr. Burnam's observation, that the greater frequency with which visceral metastases from carcinoma of the cervix have been seen in recent years may be due to the more general use of irradiation in the treatment of this disease, some of our incidental findings may be of interest. We determined the duration of life of each patient from the time of the appearance of the initial symptom. The patients in whom metastases beyond the pelvis had not occurred were those with the shortest average disease duration. The average life after the first symptom was twice as long in those who exhibited extrapelvic metastases as in the first group and the patients with metastases beyond the diaphragm lived with cancer two and one-half times as long as those who had no visceral metastases. In other words, metastases beyond the pelvis occurred more frequently after the cancer had been present for a considerable period of time.

With regard to Doctor Richardson's discussion, I should like to add that we had certain patients past 50 years of age, who lived a very long time after the onset of their disease. The majority, however, survived for so short a period that the average life for the group was much less than in the ones under 50. Furthermore, patients over 50 who were treated, lived on the average very little longer than those who had not been treated. These findings were attributed to poor tolerance of elderly patients to irradiation and to infections. We believe that for such patients irradiation should be especially planned and should be administered with extreme caution.

Several years ago we reviewed a series of over 450 patients whom we had followed up until they died. Our findings indicated that the application of radium to the primary growth in cases which have progressed to Stage IV may be actually harmful. While the average duration of life, after admission in this advanced stage, was twice as long in the patients who had received radium irradiation as in those who had not been treated, it was only one-third as long as when only high voltage x-ray treatment was employed. Since then we have been confining our therapy in Stage IV carcinoma of the cervix to high voltage x-rays. We believe that with such therapy we are securing as much or more palliation, and avoid the rapid breaking down of tissues and early death so often seen after intensive radium application in patients with advanced disease.

9. A Young Ovum of the Early Somite Period. Dr. Jennings C. Litzenberg, Minneapolis, Minn. (See page 519, October issue.)

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10. Further Studies of the Fascial Planes Surrounding the Vagina. Dr. Nathan P. Sears, Syracuse, N. Y. (by invitation). (See page 614, October issue.)

DISCUSSION

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DR. BYRON H. GOFF, NEW YORK CITY.—In 1930, before this society I presented photomicrographs of histologic cross-sections from the urethrovaginal, the vesicovaginal, and rectovaginal septa of a normal nullipara. In the sections from the urethrovaginal septum there was no connective tissue between the muscular

coat of the vagina and that of the urethra. The smooth muscle of the vaginal wall and the smooth muscle of the urethral wall fused with no line of natural cleavage between the two walls. The sections from the vesicovaginal and the rectovaginal septa correspond in every respect with those published by Blair Bell in 1910.

In the January, 1933, number of *THE AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY*, Koster, of Brooklyn, published his findings in a cross-section histologic study of the vesicovaginal and rectovaginal septa of a normal multipara. The findings in this study agree completely with those of Blair Bell.

In the cross-section histologic study of the vaginal walls and the surrounding connective tissue from a young nullipara which has just been presented, Dr. Sears has demonstrated in addition to the perivaginal areolar fascia two thin strands of connective tissue which partially surround the muscular coat of the vaginal walls. The strand of connective tissue which originates at the side of the vagina and passes in front of the anterior vaginal wall has been termed prevaginal fascia while the strand which also originates at the side of the vagina and passes behind the posterior vaginal wall has been termed retrovaginal fascia. In my opinion these two layers of connective tissue, which Dr. Sears does not consider as a part of the areolar perivaginal fascia, are in reality merely condensations of the areolar fascia which are commonly found in the neighborhood of blood vessels not only at the sides of the vagina but elsewhere in the thoracic, abdominal and pelvic cavities. I believe that the sections in Dr. Sears' study confirm the findings of Bell, Goff, and Koster. In a microscopic examination of Dr. Sears' slides I find no fascia other than the areolar perivaginal fascia which has been previously described.

I wish to stress one point: In the cavities of the body distensible organs are never surrounded by rigid layers of dense fascia. Such organs are always surrounded by areolar fascia. The vagina is surrounded by such areolar fascia only.

DR. SEARS (closing).—Although all gross dissections have agreed as to the general arrangement of the pelvic fascia, it is evident that its histologic structure can be determined only by microscopic study after special staining. I do not believe that we have reached the point where we can express a positive opinion as to what are the component structures of the layers dissected at operation and what exists as a support after operation. That would require the examination of many specimens removed at operation and at autopsy so far as possible many months after a successful repair. It is quite probable that such studies will reveal muscle and other structures beside fascia. I believe, however, that the fundamental tissue will be fascia.

Dr. Goff has said that he believes the band of tissue below the vaginal muscle to be a part of the muscle. If one traces medially the plane of fascia lateral to the vagina, it will be found that it is continuous with the layer below the vagina. This fact would tend to show that the layer beneath the vaginal muscle and the plane lateral to the vagina are composed of the same tissue. It is therefore anatomically impossible for this structure to be muscle, since vaginal muscle tissue could not penetrate the dense layer of blood vessels to appear so far lateral to the vagina. It is also true that microscopically this plane is shown taking the characteristic stain of fascia.

11. A Survey of a Series of Myomectomies With a Follow-Up. Dr. Hilliard E. Miller, and Dr. Curtis H. Tyrone, New Orleans, La. (by invitation). (See page 575, October issue.)

DISCUSSION

DR. RALEIGH R. HUGGINS, PITTSBURGH, PA.—In my opinion, it requires a higher degree of judgment and better operative skill to do myomectomies than hysterectomies. It has gradually become our habit to operate by this method, doing

myomectomies in young women who are anxious to become pregnant; that is, before the age of 35, and to cooperate to the best of our ability under all circumstances.

In a series of about 25,000 deliveries at the Elizabeth Steel Magee Hospital, during the last ten years, there have been two cases of perforation of the uterus, following myomectomy. One of these complicated a rather difficult delivery. It is necessary for the obstetrician, in a case with a history of previous myomectomy, to give careful consideration as to the method of delivery. Among 101 myomectomies we had two deaths. These were in very small subperitoneal tumors, not more than 2 c.c. in diameter and removed as a matter of routine in doing other operations. They should not be regarded as a factor in the mortality in this series.

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DR. COLLIN FOULKROD, PHILADELPHIA, PA.—From the viewpoint of the patient who desires children, we should pursue the conservative course in all young married women because, in the process of pregnancy the fibromyoma, while it is increased in size, does not offer any great menace. After the pregnancy is developed to term we must evaluate what we shall do. Most of us have done myomectomies on small fibroids, and we have left large fibroids in the uterus rather than endanger the woman's life with a major operation and ensuing blood loss. A patient who had had two or three abortions, in different cities, and who finally had a myomectomy performed with a number of fibroids removed, came to me pregnant. I found that one of the fibroids had been overlooked but as she desired to have a child she was allowed to go to term. The fibroid obstructed the delivery of the child and cesarean section was done. In the course of the recovery there was a certain amount of necrosis in the fibroid but she recovered.

The question will always arise as to how far one can go in removing these fibroids without endangering the walls of the uterus. We know that we can do several sections without endangering the uterus. Within the last week I have seen a patient on whom I had done two sections, taking out a portion of the wall of the uterus each time and neither of the previous scars had ruptured at the time the patient returned. We delivered her this week by a third section, of twins at term. One is never able to determine why these scars rupture. The extent of implantation of placenta over the previous scar has, in my opinion, more to do with the rupture of the scar than any other factor.

DR. WILLIAM R. NICHOLSON, PHILADELPHIA, PA.—It occurred to me that in these openings in the uterus, necessitated by multiple removal of tumors, the caution should always be given that the woman in the latter part of a subsequent pregnancy should be in a position where prompt relief can be given to her if these very deceiving symptoms of rupture arise.

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DR. MILLER (closing).—May I have the opportunity to speak of one or two practical points in connection with myomectomies? First, I believe the time for selection of the operation is most important; the operation should be undertaken preferably as soon after menstruation as possible. This will allow the uterine wound to heal firmly before the onset of the next menstruation. In three cases of this series I had some difficulty at the time of the operation; there was definite evidence of hemorrhage into the uterine wound, and in one instance it was necessary to open the abdomen at the lower end and drain the cavity.

I believe too much stress has been paid in the discussion of the possible rupture of the uterus in subsequent pregnancy. The same conditions do not exist as follow cesarean section, and I believe if a large series of myomectomies are reviewed from the standpoint of subsequent deliveries, very few cases of rupture will be found.

I agree with Dr. Nicholson in regard to the selection of cases. The list reported this morning were all from private work. In a large free service, with a high percentage of negro patients, we found few, if any, cases which could be treated by myomectomy. In fact, among the negro patients in the last four or five years, I have not found what I considered a suitable case for myomectomy. They rarely apply for treatment until the growths are large, and at least one-half of them merely come because of an associated salpingitis or pelvic peritonitis.

In this series reported upon, the myomectomies done during pregnancy were in each instance due to symptoms which would have eventually meant abortion. The results were uniformly happy. If the uterus is handled with care, large growths may be enucleated without disturbing the pregnancy. Ordinarily I should say that it might be a better practice to carry the pregnancy to full term, and do a cesarean section at that time, but in the reported cases conditions had arisen which would have meant an inevitable abortion unless we had interfered.

I think it requires a great deal of experience and judgment to select cases for myomectomy. Large growths may be associated with a small uterus, which presents healthy musculature; one or two small growths may be found in musculature which is definitely diseased, and make hysterectomy necessary. Another practical point which I have found of benefit is the preliminary ligation of the branches of the uterine artery at the side of the uterus before attempting enucleation. This reduces hemorrhage, and would, therefore, make use of much less catgut in closing the uterine incisions.

12. Endometrial Hyperplasia and Its Relation to Endocrine Dysfunction. Dr. James E. King, Buffalo, N. Y. (See page 582, October issue.)

DISCUSSION

DR. RICHARD W. TE LINDE, BALTIMORE, MARYLAND.—Our knowledge of the etiology may be divided roughly into three stages. First in 1900, Cullen described the condition and, at the suggestion of Dr. Welch, named it hyperplasia, thus taking it out of the inflammatory category. Second, there was the combined work of several men, Schröder, Meyer, Novak, Martzloff and Shaw, who in general agreed on the pathological finding in the ovaries. They demonstrated an absence of corpora lutea and a persistence of follicles. This suggested an absence of the corpus luteum hormone or an excess of persistence of the follicular hormone as being responsible for the hyperplastic endometrium. The third step in the advance of our knowledge concerning the etiology of this condition has to do with experiments carried out on laboratory animals and the results are somewhat confusing. Wolf, Cunningham and Burch believe they have produced changes in the glands of guinea pigs and rats, which they consider comparable to human endometrial hyperplasia. Assuming that an absence of corpus luteum secretion was responsible for the condition, commercial corpus luteum was used by many with the hope that the supplying of this deficiency would cure the condition. Results were disappointing. One very good reason for this was the absence of potency of these extracts. However, last year Clauberg changed the histological picture of the endometrium of a woman from that of hyperplasia to that of premenstrual hypertrophy by the injection of a potent corpus luteum extract. He checked his clinical results by examining curettings of the endometrium before and after the administration of the extract.

Following the production of an active extract of the anterior pituitary, which caused luteinization of the follicles in laboratory animals, Novak and Hurd attempted to treat bleeding women with hyperplastic endometrias by the injection of this hormone. In 44 of their series of 51 cases the bleeding ceased. My personal experience has not been as promising but one must admit that in certain cases in

which bleeding persists even after repeated curettage, it does stop after the administration of "Antuitrin—S."

Dr. King has mentioned Hofbauer's work, which is somewhat at variance with the views of the majority of workers in this field. Hofbauer concludes from his results obtained by the injection of acid and alkaline extracts and by the implantation of the anterior lobe "that hyperplasia may be reasonably regarded as a manifestation of overactivity of the anterior lobe." I have not been impressed with the evidence which he has brought forth in support of this theory. Some of the photomicrographs of guinea pig endometrium in his articles show no resemblance to human hyperplasia. Others do have dilated glands. I have found similar gland patterns in the endometria of untreated guinea pigs and they are not an infrequent occurrence.

So apparently the question of the relation of endometrial hyperplasia to the anterior pituitary gland is still unsettled. The present evidence, however, points more to the view that there is a deficiency of the luteinizing hormone rather than an excess.

DR. BROOKE M. ANSPACH, PHILADELPHIA, PA.—Hyperplasia of the endometrium is generally regarded as an exaggeration of the follicular phase in the preparation of the mucosa for the nidation of a fertilized ovum. The normal development of the mucosa from the postmenstrual phase throughout the interval up to the early premenstrual phase seems to be well understood and is evidently brought about and controlled primarily by the follicle ripening anterior pituitary sex hormone Prolan A, and secondarily by the follicular hormone itself. When in the course of the anabolic phase of the cycle the luteinizing hormone or Prolan B is denied, progesterin itself is not elaborated and the premenstrual changes in the mucosa fail to occur; the development of the mucosa that has already taken place may remain as it was without regression until it is acted upon again during the new cycle that follows, by the anterior pituitary sex hormone, Prolan A, and the follicular hormone from the newly developed follicle. This sequence of events may be repeated several times until the mucosa presents the structure characterized as hyperplasia. During this time there is no development of a corpus luteum, the follicles undergo atresia and ovular bleeding does not occur.

In a study of patients in our clinic at the Jefferson Hospital, in addition to the general and special clinical investigation and to the tests for the female sex hormone and the anterior pituitary hormones in the blood, we make a point of taking the endometrium for histologic study just before the time of an expected period. We do this because the histology of the endometrium seems to reflect the activity of the ovarian and the anterior pituitary sex hormones and may be taken therefore as an index of ovarian and anterior pituitary function. When there is a normal premenstrual mucosa there is usually a normal yellow body or a corpus hemorrhagicum in the ovary: this observation any one may make in the course of his operative work.

We may regard hyperplasia of the endometrium then as a hyperfolliculin and a hypolutein stage. The bleeding factor in hyperplasia is unknown. It is now more definitely evident that all uterine bleeding is not menstruation in the sense of the normal diapedesis of blood following ovulation and the formation of a corpus luteum and that uterine bleeding may occur without ovulation.

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DR. HOFBAUER, BALTIMORE, MARYLAND.—In order properly to understand the etiology of endometrial hyperplasia we must have at hand established facts. A consideration of the actual situation as regards knowledge of the causation of endometrial hyperplasia reveals that only two agents can be enumerated: sustained local hyperemia and anterior pituitary hyperactivity. The former is not primary in a strict sense, since it may be resolved into other factors (ovarian, nongratified

sexual desire, pelvic inflammation, et al.). In support of the latter may be mentioned experimental findings in guinea pigs and dogs with implantation of bits of anterior lobe, particularly with our new method of using exclusively the peripheral parts of ox pituitary which abounds in eosinophilic cells; the findings of anterior lobe hormone in the blood in about every ninth case of hyperplasia; positive Aschheim-Zondek tests in certain cases of hyperplasia; the actual demonstration of hyperplasia and hypertrophy of the anterior lobe in a fatal case of endometrial hyperplasia (Frankl); the occurrence of endometrial and muscular hyperplasia in cases of acromegaly (Teel).

The anterior pituitary registers its direct effect upon the basal layer of the uterine mucosa as judged by the response of this structure to pituitary administration in ovariectomized animals.

Hence, the anterior pituitary controls the regeneration of the uterine mucosa, after labor and abortion. Endometrial hyperplasia in the preclimacteric should be considered as a manifestation of anterior pituitary hyperactivity in the presence of, and associated with, insufficient or altered ovarian activity.

DR. EMIL NOVAK, BALTIMORE, MARYLAND.—While almost everyone feels that the anterior pituitary is behind the ovarian dysfunction characterizing hyperplasia, I agree with Dr. King and Dr. TeLinde that experimental investigations upon the mechanism involved have thus far been unsatisfactory. Dr. Hofbauer's work, as I understand it, was done with the growth hormone, which exerts a stimulating effect upon the growth of all tissues. For this reason, even aside from the objections pointed out by Dr. TeLinde, its pertinence seems open to question.

The most interesting phase of this problem is as to the hormone factors concerned in the bleeding. We have been in the habit of saying that the hemorrhage is the result of an excessive and prolonged secretion of folliculin, i.e., a hyper-folliculinism. As a matter of fact, so long as the endometrium is receiving a steady supply of folliculin, bleeding will not occur. The evidence now seems quite complete that functional uterine bleeding, as well as the bleeding of normal menstruation, is due to a withdrawal or sharp diminution in the folliculin effect. Such bleeding could probably, as a matter of fact, be held in abeyance, for a time at least, by giving sufficient folliculin to keep the endometrium propped up, as it were, though there would no doubt be a limit to such an artificial inhibition of the bleeding.

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DR. KING (closing).—I think from the physician's standpoint, and in fact from the whole standpoint from which I have tried to present this review, the subject is extremely complicated and sometimes by reviewing it we can more or less crystallize some of our own ideas. Certainly there is yet much to be done by the physician who, keeping these theories in mind, may do something to add proof or disproof to the theories.

13. **The Occipito-posterior Position.** Dr. G. C. Melhado, Montreal, Canada (by invitation). (See page 696.)

14. **Presidential Address: The Background of Our Natal Year.** Dr. Floyd E. Keene, Philadelphia, Pa. (See page 471, October issue.)

15. **Anatomical Variations in the Female Pelvis and Their Effect in Labor With a Suggested Classification.** Dr. William E. Caldwell, New York City and Dr. Howard Molloy, New York City (by invitation). (See page 479, October issue.)

DISCUSSION

DR. HERBERT THOMS, NEW HAVEN, CONN.—Last year I presented before this Society 20 cases of anthropoid and android pelvis, each one of which was associated with primary or secondary occiput posterior. We have now seen 40 cases of that

kind in our relatively small clinic, so that we have come to consider the normal pelvis as possibly occurring in one of these three groups. The flat pelvis, it seems to me, may not belong in this group of natural variations. I think we may continue to call it the simple flat pelvis because we will continue to speak of pelves by their English names, that is, round and flat pelves. As Dr. Caldwell and Dr. Molloy have stated, the simple flat pelvis is very rare and perhaps is a rachitic manifestation when it does occur. The posterior position of the occiput must be treated in one manner if due to a flat pelvis, but if the pelvis is the anthropoid type it will have to be treated by a different method. It is therefore extremely important to know what the true pelvis is like before one attempts to deliver a posterior position.

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DR. CARL HENRY DAVIS, MILWAUKEE, WIS.—It seems apparent that in the management of the occipitoposterior, the type of pelvis must control the final decision.

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It is obvious that with certain types of pelves we would have no difficulty in reengaging the head and in delivering with forceps.

Dr. Caldwell brought out a very important point in that there are other factors besides the pelvis. I work in a community where there are a surprisingly large proportion of babies with round heads. Obviously a combination of the shape of the pelvis and the shape of the baby's head must be considered. We must be careful in making an attempt to forecast what will happen because we do not know the shape of the baby's head in advance except as we get x-ray pictures, and then we cannot forecast this accurately. There is no doubt that a careful x-ray of the pelvis is a very valuable adjunct to our other methods.

DR. COLLIN FOULKROD, PHILADELPHIA, PA.—I may have misunderstood the paper presented by Dr. Melhado regarding one or two points. It seemed to me that we should record ourselves as being opposed to the rejuvenation of the old operation of catching the fetal head and bringing it into the pelvis. The procedure takes the line of least resistance for a man who is unable to secure good results with version. He does a partial version in a case that should be solved by a normal forceps operation and then will grab the head and work it down into an adjustable position. There is always some risk for an occiput posterior and it is impossible to apply any one particular maneuver to solve all problems. I should feel very uncomfortable if the criterion that is given in the paper was thought of as a measure of producing an elective operation. Dr. Melhado suggested, I think, that the criterion was the cessation of rapid advance in labor. That is a little broad because I doubt whether any occiput posterior advances rapidly. In other words, after the situation is ideal for doing either a version or a forceps maneuver, to start and do an operation because of lack of rapid advance in an occiput posterior progress is to my mind making it an elective operation with almost all of his occiput posterior positions. It would seem to me that the dangers incident to applying the forceps in the hands of any excepting the very expert operator would lead us to avoid stressing that as an alternative method for version when the version operation is the method of choice in an occiput posterior case.

DR. OTTO H. SCHWARZ, ST. LOUIS, MO.—I notice that forceps with a pelvic curve were used. I would like to know why the Kielland or the Barton forceps were not used under these circumstances?

DR. MELHADO (closing).—By the term "rapid advance" I did not mean to imply that the head must be "coming down" extremely rapidly, but that the advance must be a definitely progressive one. Failing this, the longer interference is delayed the greater is going to be the fetal mortality and maternal morbidity. That has

been our experience. It was shown that when rotation of the head failed to occur the fetal mortality rose from 0.7 per cent to 5.5 per cent,—surely that is sufficient ground on which to adopt a policy of early interference.

I have had no great experience with the Kielland forceps. I have used the Barton forceps occasionally with satisfaction, but my preference is for a forceps with a good pelvic curve.

DR. CALDWELL (closing).—The failure of the presenting part to adjust itself to the most favorable diameter of the pelvis is the chief cause for dystocia and is found much more frequently than real bony disproportion. The occiput posterior positions with extension of the head or asynclitism, giving a larger diameter of the presenting part to descend through the birth canal, when not corrected prolong the labor, prevent retraction and dilatation of the cervix, give weak, tiresome, ineffective pains and lead to difficult operative procedure. Though the majority of women will ultimately correct and mold these malpositions, their early recognition and correction will greatly reduce the difficult labor and operative incidence. The bony architecture of the pelvis must be thoroughly studied to determine in which diameter the child's head will best fit. In many cases it is best to allow an occiput posterior to descend well down into the birth canal rather than to do an early rotation. We feel that it is a mistake to routinely do versions or rotate the head above the brim, and that when the bony architecture is thoroughly understood and flexion is maintained these major operations are seldom necessary.

I agree with Dr. Melhado that correction of malpositions should be done as early as possible and I congratulate him on his manual dexterity which has given him such good results; but I am inclined to think that in the hands of less skillful operators less dangerous procedures are equally effective and less risky.

16. Reaction of the Mature Human Ovary to Antuitrin-S. Dr. Samuel H. Geist, New York City. (See page 588, October issue.)

DISCUSSION

DR. ROBERT T. FRANK, NEW YORK CITY.—The human ovary is a very variable and varied organ, most difficult to study. Dr. Geist was certainly aware of this and consequently unable to formulate anything definite from the literature, that is, the descriptions of Zondek, etc. They lacked the detail so necessary from which to draw conclusions.

Of the changes mentioned, the least convincing are the hemorrhage and the engorgement, particularly as most of the ovaries were from fibroid bearers; but to find definite changes in 33 cases out of 40 receiving doses of anterior pituitary lobe hormone, and only in 4 cases out of 25 of noninjected ones shows that with such a percentage difference, some importance must be ascribed to the injections.

The importance of his work is that it gives us data on the human female. Those of us who work in the laboratory with animals have found such tremendous differences in different species. For instance, the resistance of the ovary of the rodent and of the monkey is so different that at first it proved extremely misleading to different investigators.

Although the apparent acceleration of follicle growth might be accidental, still the increase in luteinization seems to be definitely ascribable to the drug used. This is an advance as far as positive knowledge is concerned. What its clinical importance may be, I am quite unable to state, because if we simply theorize and say that by injecting follutein the luteinization of the cells follows, we are none of us as yet certain just what physiologic importance is ascribable to this change and it will require extremely careful clinical study to give us any definite information, because there is no test animal less reliable than the human female.

DR. KARL M. WILSON, ROCHESTER, NEW YORK.—I would like to emphasize that while the hormone found in the urine of pregnant women is in some respects similar in its activity to that of the anterior pituitary body, yet it is undoubtedly an entirely different hormone. It is important to keep this in mind both from the standpoint of the study of the function as well as from the standpoint of therapy.

Through the courtesy of Dr. Corner, I am permitted to show you the effect of the urinary hormone on the ovary of the immature Rhesus monkey. This animal received 1,200 rat units of antuitrin over a period of ten days, and shows in the ovaries marked fibrotic changes in the follicles with no particular development of lutein cells. I would like to see Dr. Geist repeat his experiment, carrying out the administration of antuitrin over a longer period of time, and perhaps he would then get a result more nearly comparable.

From the clinical standpoint, I am inclined to urge a word of caution in the use of these various hormones until we know a little more about what we are trying to do. If it is the effect of the anterior pituitary hormone which we wish to obtain in a patient, it would seem more logical to administer that particular hormone rather than the one obtained from the urine of pregnant women. In my clinic we have under observation at the present time a small series of women showing menstrual disturbances which we have definitely diagnosed as being due to deficient activity of the anterior pituitary body, and which have been relieved by the administration of anterior pituitary gland substance.

DR. GEIST (closing).—Dr. Frank's remarks about the gross appearance of the ovary associated with the ordinary fibroids are quite true. We made our observations before any operative procedure was undertaken so that the question of trauma was to a certain extent eliminated. It is true that the mere presence of a fibroid may cause gross changes in the ovary, but the percentage of injected cases that responded was so high that coincidence seems to be ruled out.

The picture that Dr. Wilson showed on the screen of the immature monkey is very similar to that shown by Dr. Engle at Columbia and whether we can reproduce that condition in the human by further injections I do not know. These patients had to be operated on, and were observed for three or four days previously.

At the present time we are all confused about results of these various anterior pituitary hormone-like drugs (which are purely empirical) in cases of bleeding. We know very little about bleeding at the present time and the effect that one obtains in the ovary would hardly make one believe that the injection of an anterior pituitary-like substance would control or regulate bleeding. Ordinarily we have felt that bleeding is associated with just the type of lesion in the ovary that results from Antuitrin-S injections. I think that we are progressing in our knowledge and it is well to continue our experimental efforts until we know something more about the actual physiology of menstruation and pathologic bleeding.

17. An Evaluation of the Bissell Operation for Uterine Prolapse Based on a Follow-Up Study. Dr. Byron H. Goff, New York City. (Published in *Surgery, Gynecology and Obstetrics*.)*

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18. Pelvic (Rectal) Palpation of the Female Monkey With Special Reference to the Ascertainment of Ovulation Time. Dr. Carl G. Hartman, Baltimore, Md. (by invitation). (See page 600, October issue.)

DISCUSSION

DR. EMIL NOVAK, BALTIMORE, MD.—There is an enormous value to gynecology in such studies as Dr. Hartman has been making.

*The discussion of this paper appears in full in the current volume of Transactions of the Society.

However, it does not seem possible to avail ourselves of this method of bimanual palpation in determining the occurrence or nonoccurrence of ovulation in women. The mature follicle in the woman is not a very prominent structure, while atretic follicles may be very much larger, so that no conclusions can be drawn from palpation findings. It would be of the greatest value to have some simple method of determining the occurrence of ovulation in women, for I am firmly convinced that anovulatory menstruation is not as rare a phenomenon as we have been in the habit of believing, and that it explains at least some cases of sterility. There is a not inconsiderable group in which all other factors seem to be eliminable by such methods as examination of the husband, Rubin tests, metabolic examinations, etc., and in which sterility nevertheless persists. In this group will be found some who, while menstruating perfectly normally, are giving off no ova. The differentiation and the treatment of this group constitutes an important phase of the problem of sterility.

19. End-Results in Treatment of Pelvic Infection. Dr. Albert H. Aldridge, New York City (by invitation). (See page 705.)

DISCUSSION

DR. GEORGE W. KOSMAK, NEW YORK CITY.—Speaking in a reminiscent vein, memory goes back to a generation to the days when the radical treatment of pelvic infections was to the fore and the theatric display of pus tubes removed by laparotomy, was common. I doubt, however, whether a careful follow-up study was made of these cases such as Dr. Aldridge has outlined and, of course, it is upon these follow-up studies that future methods of treatment must depend. What probably saved a great many women in those early days was the lack of diagnosis and the more or less spontaneous cure of these cases; except where formation of a natural pelvic abscess brought about evacuation by a colpotomy. That applied also to the former treatment of ectopic gestations which, in many instances, were likewise not recognized; ruptures and hematoceles occurred. The latter became infected and were similarly evacuated, the patients finally recovering.

I believe that the success of the conservative methods depends largely on the introduction of protein therapy in recent years. Dr. Aldridge's cases I assume were almost entirely hospital cases. We get equally good results from the conservative methods of treatment in private practice and I think a great many of these cases, especially of the milder grades of tubal infection, can be very well treated without hospitalization and with equally good results.

There is one class of tubal infections which was not mentioned in which the question of operation must be most carefully considered, namely tuberculous salpingitis. I think we are very apt to trip up on our diagnosis, and we may continue treating such patients with conservative methods when it might be better to remove these infected tubes.

DR. HARVEY B. MATTHEWS, BROOKLYN, N. Y.—We have used pasteurized milk as a foreign protein and have obtained excellent results in a large group of cases. None of the manufactured "stock" activators are as activating as pasteurized milk.

We have used the Elliot treatment. Some of us feel that this is a much better form of treatment than the foreign protein method.

In determining when to operate we go through all of the laboratory and clinical gamuts to determine whether the case is chronic or not. We do not operate except when we feel sure that the case is chronic.

In looking over our records* for the past three years to January, 1933, amounting to 305 cases, I found that we have operated on 62 per cent of our patients; 38 per

*At the Long Island College Hospital.

cent therefore were not operated upon. These are pretty much the same percentages that Dr. Aldridge has shown. The radical operation was done in 52 per cent of our cases and the conservative operation in 48 per cent. The radical operation in salpingitis alone was done in 33 per cent; for fibroids, retroversion and salpingitis, in 66 per cent. This bears out the point that Dr. Aldridge made, viz.: that salpingitis with retroversion, or particularly with fibroids, is seen earlier and better managed because of this coexisting pathology.

DR. FREDERICK C. HOLDEN, NEW YORK CITY.—Last year we had 2,600 patients admitted to the Bellevue gynecologic ward service. As to the treatment we have a better opportunity than some of the private hospitals in that we keep patients there over an indefinite period of time.

In cases of salpingitis, with a short sedimentation time, acute bilateral pain, the patient may or may not have gonococci in the cervix in a large group of our cases. We have about 130 cases of this type. A very large percentage, and I say it unreservedly, left the hospital symptom-free and with a minimum of pelvic pathology. The points we stress are these: the patient has an ice-bag for the relief of pain and maybe an opiate as a sedative. We speak in terms of splinting the patient, not allowing her to move. She has a moderate elevation of the bed to allow drainage of the pelvis and has complete rest, not being allowed to sit up to eat. The bowels must move adequately each day, preferably by means of a mild laxative, and if there has been no movement by night an enema is given. She has a diet which does not distend the intestinal tract.

These patients are examined bimanually very infrequently. We feel that bimanual examination disturbs the inflammatory process. When the patient goes home she is given certain directions as to her living. She is told that it is impossible to undertake sex life; to stay in bed for the first two or three menstrual periods, to avoid long automobile rides, to observe the same bowel hygiene as prescribed in the hospital. It is surprising what good results one gets if you talk to these ward patients, simply telling them what nature has done for them and how essential it is to continue that mode of life. The husbands should be eliminated, otherwise the patients very soon become reinfected.

DR. ALDRIDGE (closing).—Mild cases were treated in the out-patient department with small intracutaneous injections of foreign protein, medicated tampons and vaginal douches when indicated. Many patients become symptom-free and completely healed under such treatment. We recognize the importance of rest, but experience proves that many patients with mild attacks of inflammation can continue with their routine duties while treatment is being given.

About one-half of the patients admitted to the hospital were treated with intramuscular doses of foreign protein. If symptoms recurred after they were discharged from the hospital, they were referred back to the out-patient department where the treatment was continued usually with small intracutaneous doses.

If the patient can be made to understand the danger and disadvantages of operation, it is usually not difficult to get her cooperation so that palliative treatment can be given a fair trial.

20. Breech Deliveries With Reference to X-ray Measurements of the Fetus and Maternal Pelvis. Dr. Thomas R. Goethals, Boston, Mass. (by invitation). (See page 715.)

DISCUSSION

DR. EDMUND B. PIPER, PHILADELPHIA, PA.—In 1926, I called attention to the depth, length, and height of the symphysis, as a factor in determining any accurate measurements of the true conjugate. That measurement ordinarily is practically

valueless. Pelvic measurements are a guide, a warning, but I do not think they should ever be used didactically. In the first place I should say from my experience that the delivery of the after-coming head in a breech presentation is much more delicate than in other positions because the head is not molded; it does not conform to the pelvis in any way, shape, or form. In the second place, my own experience would lead me to feel that I have more trouble with the arms than with the after-coming head. There was a case in our service at the Lying-In Hospital of a multipara, the seventh baby. I do not think any x-ray examination was made as she came in from the out-patient department. The membranes had been ruptured forty-eight hours when I saw her and the breech did not come into the pelvis, but she had had a great many babies and had a record of no great difficulty at delivery. In this case the feet were up around the face. Potter used to say, fold them over the head and perhaps they will go up backward. If you do that the shoulders will come down and it is then a question of the inclination of that pelvis as to whether they will catch. That is exactly what that case did, it got caught at the umbilicus. It was discovered afterward that the baby had a tremendously large head.

Another factor I would like to bring up is the question of the biparietal diameter. If a finger is placed in the baby's mouth and instead of trying to get the head in a diagonal position, rotate it to a transverse position, you will get the head past the symphysis pubis.

DR. GOETHALS (closing).—I am interested to learn of Dr. Piper's uncertainty as to the true conjugate in certain types of cases, because our difficulty has been to know whether our x-ray measurements of the true conjugate are more or less accurate than the reckoning of the conjugata vera from the measured diagonal conjugate. That is what we are trying to find out.

With regard to a situation where this method of x-ray mensuration may serve as a guidepost on our way, I have the record of such a case where I think it was very definitely a guide. (See history of the case of Mrs. F., as reported in detail in the body of the paper.)

I feel with regard to this problem of breech delivery that it is unquestionably true that undilated cervixes are the cause of more babies being lost, probably, than are pelvic contractions. In the case reported in the paper, for which I must take the full responsibility, I knew in advance that we had a fair chance of losing the baby before the operation was attempted, and I have nobody to thank for the outcome but myself.

21. **A Study of the Effects of Theelin on Gonorrheal Vaginitis in Children.** Dr. Robert M. Lewis, New Haven, Conn. (by invitation). (See page 593, October issue.)

PACIFIC COAST SOCIETY OF OBSTETRICS AND GYNECOLOGY

MEETING OF DECEMBER 9, 1932

The following were among the papers presented which were found suitable for inclusion in the JOURNAL:

Granulosa Cell Tumors of the Ovary. Dr. Margaret Schulze. (See page 627.)

Nicotine in Breast Milk. Dr. W. B. Thompson. (See page 662.)

A Five-Year Study of Abortion. Dr. R. E. Watkins. (See page 161, August issue.)

The Problem of Irregular Menstruation. Dr. C. F. Fluhmann. (See page 642.)

Hemorrhage Following Cesarean Section. Dr. J. M. Slemons. (See page 656.)

An Analysis of 575 Cases of Eclamptic and Preeclamptic Toxemias Treated by Intravenous Injections of Magnesium Sulphate. Dr. E. M. Lazard. (See page 647.)

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review

THE INTERRELATIONSHIP OF THE ANTERIOR HYPOPHYSIS AND THE OVARIES

(THIRD REPORT. LITERATURE PUBLISHED BETWEEN JUNE, 1931,
AND JUNE, 1933)*

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THE past two years have witnessed a development in our knowledge of the physiology of the anterior hypophysis which leaves one aghast at the extent and complexity of the problem. Of primary importance, so far as gynecologists and obstetricians are concerned, are those phases of the work which deal with the gonad-stimulating factors of the anterior lobe, and this review is not an attempt to present a complete analysis of all papers published, but to summarize some of the recent discoveries in order to indicate the trend of modern research in this field.

OVER-STIMULATING HORMONES OF THE ANTERIOR HYPOPHYSIS

The operation of hypophysectomy in laboratory animals is now successfully performed in several laboratories, so that many new and important facts are constantly brought to light. Smith and White¹⁹⁰ have found that hypophysectomy in rabbits which ovulate results in the corpus luteum undergoing regression after a two-day period of growth. In pregnant does this is accompanied by a termination of gestation (White²²⁰; Firor⁴⁹), and at certain stages of pregnancy there may be a temporary remarkable hyperplasia of trophoblasts (Firor⁴⁹). If rabbits are hypophysectomized on the fifth or sixth day of gestation the corpora lutea lose within forty-eight hours their power to inhibit uterine contractions induced by estrin (Reynolds and Firor¹⁷⁰). Blocking the pituitary circulation of pregnant rabbits produces results identical to those following hypophysectomy (White²²⁰). Smith¹⁹⁷ has studied the effects of incomplete removal of the anterior hypophysis in rats, and found that if 30 per cent or more of the organ remains, the gonads do not show any abnormal changes. Hill and Parkes⁸⁰ have reported that removing the hypophysis of a ferret more than one hour and fifty minutes after copulation does not inhibit ovulation, but the corpora lutea fail to develop normally. Pencharz and Long¹⁵⁷ have found that if hypophysectomy is performed in the pregnant rat, there is a prolongation of the period of gestation by three or four days and the mothers die without being able to give birth to their young. Swezy and

*See First Report: AM. J. OBST. & GYNEC. 18: 738, 1929. Second report: 22: 803, 1931.

Pencharz^{210, 211} have made the important observation that after hypophysectomy there are many more ova and follicles in the ovaries of rats than under normal conditions, and there is abundant evidence of the formation of new germ-cells from germinal epithelium. Since they also find fewer ova and follicles in the ovaries of rats treated with pituitary implants, Swezy and Evans,²⁰⁹ and Swezy²⁰⁸ believe that the maturity factor of the anterior lobe depresses ovogenesis or the production of new germ-cells, although Butcher¹³ suggests that germ-cell proliferation from the germinal epithelium is inhibited merely by the space relations and pressure of the numerous corpora lutea.

Many workers are still skeptical about the existence of two sex hormones of the anterior lobe, one responsible for follicle development (APH-A) and one for luteinization (APH-B). Although Van Dyke and Wallen-Lawrence²¹⁴ were unable to confirm the original work of Fevold, Hisaw and Leonard, Fevold and his collaborators⁴⁷ have published further impressive evidence that they have secured a partial separation of two such factors from sheep anterior lobe tissue. Smith and White¹⁹⁹ could not support the conception of dual hormones from the results of their hypophysectomy experiments in rabbits. Loeb¹³¹ has considered the possibility of two hormones, one concerned with follicle growth and maturation processes of the granulosa and a second which acts in the opposite manner and leads to degeneration of the granulosa and thecal luteinization. Aron³ thinks that gonadal hormones have nothing to do with any of these processes but are merely *motor* for the production of estrin.

An important recent development has been the recognition of species differences in the effects induced by the anterior hypophysis from various donors, and a number of valuable observations have been made by Loeb^{128, 129, 130} and Loeb and Friedman¹³³ who have found two main types of anterior lobes according to their effect on the thyroid and sex organs of immature guinea pigs. Conversely, the test animal may also present differences, for example, with certain extracts it is difficult or impossible to produce more than thecal luteinization of the guinea pig ovary (Aron², Guyenot, et al.,⁶⁹ King⁹⁹). Lipschütz¹²² believes that the anterior lobe of guinea pigs contains essentially only a follicle-stimulating factor, and Hellbaum⁷⁴ reports a similar characteristic of the pituitaries of horses. Hertz et al.⁷⁵ have drawn attention to a preparation of a growth hormone which has no gonadal effect in the rat but is capable of inducing luteinization in young rabbits. Hisaw and his co-workers⁸⁶ obtained a maximal ovarian response with an anterior lobe extract in monkeys and rabbits after eight to ten days of treatment, and following this a regression of ovarian changes occurred in spite of continued injections. Fluhmann⁵⁶ reported a similar finding in regard to the stimulation of increases in ovarian weight in rats with an acid sheep anterior pituitary extract. Lipschütz¹²⁴ and Lipschütz and Reyes¹²⁷ found that anterior lobe inoculations from immature rats are more potent than those from adults, while Ellison et al.³⁶ and Lipschütz and Reyes¹²⁶ found those of males more effective in inducing ovulation in rabbits than those of females. On the other hand, Wolfe and Cleveland²³¹ observed no sex differences in rabbits although the anterior lobes of very young females were deficient. Lipschütz^{123, 125} was able with guinea pig implants to induce estrin effects in immature rats without producing apparent ovarian changes. Emery³⁷ has pointed out that after pituitary implants the ovaries and uteri of immature rats may continue to increase for a period of two weeks. Hogben and Charles⁸⁷ noted a prolonged fall in the calcium content of the blood serum of normal and spayed rabbits after the injection of a fresh saline suspension of ox pituitary material. Reynolds¹⁶⁸ found that anterior pituitary extracts have a direct effect on the motility of the uterus of the unanesthetized rabbit. The contention that anterior

pituitary material is effective by mouth (Lepine,¹²¹ Janssen and Loeser,⁸⁰ Gutowska⁶⁸) brings up an old question anew.

An interesting discussion of the concept of "precocious sexual maturity" was given by Engle,³⁹ who observed that in immature mice once treated with anterior lobe implants the first normal estrus occurred at a significantly later date than in normal controls. Riddle¹⁷¹ found that the immature dove or pigeon is especially suited for testing the maturity factor of the hypophysis. Leonard¹¹⁴ noted the inhibition of the sex factor of the anterior lobe by the growth hormone, and suggested the possibility of a separate factor for ovulation. Wislocki and Snyder²²⁸ have successfully induced superfetation in the rabbit, while Shelesnyak¹⁸⁹ produced placentomata in young rats following inoculation of anterior lobe tissue.

Lack of space unfortunately prohibits extensive reference to recent studies on the thyrokinetic hormone of the anterior lobe, but some interesting observations regarding the interrelationship of this substance and the gonad-stimulating factor have been made (Loeb and Friedman;¹³² Riddle, Bates and Dykshorn;¹⁷² Green;⁶⁶ and others). Of importance and also beyond the scope of this review, is the recognition of the controlling influence of the pituitary gland over lactation and adrenal function.

HISTOLOGIC STUDIES OF THE ANTERIOR LOBE AND MODIFICATION OF THIS ORGAN BY OUTSIDE INFLUENCES

A considerable number of histologic studies of the anterior hypophysis have appeared during the past two years. Rasmussen¹⁶⁰ has given an interesting preliminary report of a study of the human adult female hypophysis. He made a differential count of the various cell-types, noted merely a slight increase in the percentage of chromophobes during pregnancy and stated that although the anterior lobe enlarges, "no special so-called pregnancy cell could be identified." The cell-types of the anterior lobes of several species of experimental animals have been studied by Wolfe and Cleveland²³³ and cyclic variations in this organ have also been described (Wolfe and Cleveland;^{232, 234} Wolfe, Cleveland and Campbell;²³⁶ Reese¹⁶¹). Nelson,¹⁴⁴ in an extensive study, has given details of the development and cytologic differentiation of the anterior hypophysis of the fetal pig, and also found¹⁴³ that no characteristic changes occurred in the anterior lobe of female vitamin-E-deficient rats while the males presented castration effects. Guyer and Claus⁷⁰ reported that the anterior hypophyses of cancer-implanted rats resembled those of castrates. Wolfe and Cleveland²³⁵ have described characteristic pregnancy changes in the anterior lobe of the rat, while Haterius⁷² has discussed the time of the appearance and duration of "pregnancy cells" and believes⁷³ with Charipper and Taylor¹⁶ that they are the effect of a stimulus originating in the corpus luteum. Brouha⁹ and Desclin³¹ found pregnancy changes in the anterior lobes of guinea pigs during pseudopregnancy, while Siegmund¹⁹⁵ believes that such modifications are brought about, not by a corpus luteum hormone, but by estrin. On the other hand, Stein^{205, 206, 207} was unable to find in pregnant rats any change in either volume or size of the anterior lobe, and no "pregnancy cell" or other recognizable histologic departure from the nonpregnant. (Our concepts of the histology of the anterior hypophysis may now be considered as hopelessly muddled as any other phase of this complex subject.)

A cyclic variation in the gonad-stimulating potency of the anterior lobe, with a diminished capacity at the time of estrus, has been described for the sow (Wolfe²²⁹), and the rat (Siebert^{193, 194}). This characteristic is explained on the basis of estrin production and the inhibition of the anterior hypophysis which this hormone produces. Moore and Price¹⁴¹ have given an extensive version of their important

studies on this problem, and further evidence also has been advanced by other workers who have succeeded in preventing castration changes in the anterior lobe of various species by the administration of estrin (Hohlweg and Dohrn;^{88, 89} Nelson;^{145, 146} Friedl⁵⁹). Pincus and Werthessen¹⁵⁸ have corroborated the finding that prolonged injections of estrin to young rats inhibit ovarian growth, while Spencer, et al.²⁰⁴ reported that this effect may be offset by the simultaneous injection of a hypophyseal growth factor or prol.^{*} Kuschinsky¹⁰⁹ found a diminished hormone content of the hypophyses of adult female rats given prol.^{*} for ten days, while Klingler,¹⁰⁰ Klingler et al.,¹⁰¹ Wolfe et al.²³⁸ believe there is a factor in the human placenta which increases the size and gonad-stimulating power of the hypophysis, and corroboration of this observation is found in the enlargement of the anterior lobe of rats which results from the administration of the A.P.L. placental extract (Collip et al.²⁴).

A postcastration increase in the gonad-stimulating power of the anterior hypophysis of the guinea pig has been reported by Severinghaus,¹⁸⁷ while Wolfe²³⁰ found that this does not occur with the rabbit. Wolfe et al.²³⁹ have described anterior hypophyseal changes in rats following extreme partial castration, and Emery³⁸ has demonstrated again the presence of a gonad-stimulating hormone in the blood and urine of spayed rats. McQueen-Williams¹⁴⁰ was unable to prevent castration changes by the administration of hypophyseal implants, but Targow²¹² found that a growth extract caused a diminution of the weights of both lobes of the hypophysis of spayed rats.

On the basis of implantation experiments with various types of pituitary adenomas, Kraus¹⁰⁴ believes that, in the human, eosinophiles produce the sex hormone as well as basophiles. However, Zondek^{242, 244} claims that the basophiles are the cells concerned since human posterior lobe tissue has gonad-stimulating properties and basophiles are the only type of anterior lobe cells present in this part of the organ.

YET ANOTHER SEX HORMONE OF THE ANTERIOR LOBE?

In my previous review of this series⁵¹ attention was directed to the preliminary reports of Reichert et al.^{162, 163} and Evans et al.⁴³ that prol.^{*} was singularly ineffective in hypophysectomized animals, but that gonadal stimulation could be obtained if an extract of hypophyseal growth hormone was given along with it. This activation was further demonstrated in immature rats by Evans, Meyer and Simpson,⁴⁴ who evolved the theory that prol.^{*} is of the nature of an "activator" which either converts an inactive "prohormone" in the hypophysis to an active form or else is able actually to convert the growth-stimulating into a gonad-stimulating principle. Leonard,¹¹⁵ however, pointed out that this activation is not strictly characteristic of the growth hormone alone, since it could be obtained with a growth-free gonad-stimulating hypophyseal extract and Collip and his coworkers²⁵ then suggested that the complementary hypophyseal substance which is necessary for prol.^{*} to produce follicles and corpora in hypophysectomized rats is probably not identical with any of the known pituitary hormones. Evans, Simpson, and Austin⁴⁵ have subsequently brought forward evidence favoring the conception that the hypophyseal substance which produces increased gonadotropic effects when combined with prol.^{*} is neither the growth nor the gonad-stimulating factor, and is thus a new, hitherto unrecognized principle.

^{*}The name "prolan" was originally applied to a preparation made from urine of pregnant women and is now frequently employed as referring also to gonad-stimulating substances obtained from pituitary glands. In this review, it is used solely for the gonad-stimulating hormone of pregnancy, whether found in the urine, blood, or placenta, an interpretation which has been given to it by a number of American investigators.

THE RELATION OF GONAD-STIMULATING HORMONES FROM PREGNANT WOMEN
TO THE ANTERIOR PITUITARY SEX FACTOR

One of the most important and vexatious questions relating to this general problem is that dealing with the relation of the gonad-stimulating hormone from pregnant women to the anterior hypophysis. It was originally assumed by the German school that prolan from urine of pregnant women is an anterior pituitary hormone, and this conception has received widespread acceptance in spite of the warnings soon given by Engle, Orban and Watrin, and Collip, that although these substances are similar they might not be identical. Unfortunately a solution has not been reached, and although no convincing evidence has been advanced showing that prolan is an anterior pituitary hormone the past two years have brought a convincing array of facts demonstrating important fundamental differences in the properties of the two substances.

1. In the first place, Reichert et al.^{162, 163} showed that prolan is relatively ineffective in producing ovarian changes in hypophysectomized animals, an observation which soon received confirmation (Wallen-Lawrence and Van Dyke²¹⁷). Although some differences exist as to details it seems established that prolan in hypophysectomized rats produces extensive luteinization of thecal cells with increase of interstitial tissue and the induction of estrous changes in the vagina (Noguchi,¹⁴⁹ Collip et al.,²³ Wade et al.,²¹⁶ Smith and Leonard,^{198, 120} Leonard, Kurzrok and Smith¹¹⁹), a finding which is in striking contrast to the development of follicles and corpora lutea which can be induced by anterior lobe implants in hypophysectomized rats or dogs (Smith, Reichert). (A difference apparently exists as to the effect of prolan in the rabbit, since Hill and Parkes,⁷⁷ and White and Leonard²²¹ succeeded in producing ovulation after hypophysectomy. It has been shown experimentally by Markee and Hinsey¹³⁶ that the reason for this probably lies in the fact that these workers injected the pregnancy urine at about the time of operation when some anterior pituitary substance was still present in the animals.)

2. The second important difference between prolan and anterior lobe sex hormone lies in the comparative inability of the former to induce great increases in the ovarian weight of immature rats in short experiments. This was demonstrated with A.P.L. extract by Collip et al.,^{26, 27} and Evans, Meyer and Simpson⁴⁴ showed that in spite of increasing the dose of a prolan extract a certain level was reached beyond which increases in weight could not be obtained in *five-day experiments*, an observation confirmed by using a pregnancy blood extract (Fluhmann⁵⁵), and urine (Emery³⁷).

3. Although anterior hypophyseal sex hormone readily produces increases in the weight of the testes of chicks or immature pigeons, prolan is ineffective in this regard (Riddle and Polhemus;¹⁷³ confirmed by Reiss, Pick and Winter;¹⁶⁸ Leonard;¹¹⁸ and Leonard, Kurzrok and Smith¹¹⁹).

4. While it has been possible to produce in monkeys follicle growth and resultant estrin effects such as enlargement of the uterus or sex skin changes by the use of anterior lobe implants (Hartman and Squier⁷¹) or extracts (Hisaw, Fevold and Leonard^{83, 84}), and luteinization of the ovaries with higher doses of a pyridine extract (Hisaw et al.⁸⁵), the administration of prolan even at high doses and for long periods of time does not produce any follicle development in the ovaries (Novak and Kun,¹⁵³ Ehrhardt,³⁵ Engle,⁴¹ Diddle and Allen³²). Of interest, also, is the production of uterine bleeding in monkeys by both prolan and an anterior pituitary extract and an apparent difference in the mechanism by which it was brought about. In the case of prolan the bleeding took place during the course of the treatment (Engle^{40, 42}), while with the anterior lobe extract it occurred

from four to nine days after cessation of the injections (Saiki¹⁷⁹), thus suggesting estrin withdrawal as the cause of the hemorrhage. (Saiki has also made an important contribution in pointing out that he failed to produce bleeding in castrates by this method.)

5. Prolan stimulates the testis and ovary with equal facility, while ovary-stimulating hormones of the anterior lobe stimulate the ovary in a much smaller dose than that having a moderate effect on the testis (Wallen-Lawrence and Van Dyke²¹⁷).

6. During pseudopregnancy induced in the rabbit by single injections of anterior lobe substance or urine of pregnant women there was found a luteinization of the ovaries, a progestational proliferation of the endometrium, and an inhibition of the *in vitro* reaction of uterine muscle to posterior pituitary extract (Robson¹⁷⁴). The same phenomena could be produced by daily injections of pregnancy urine extract, but the daily injection of anterior lobe substance resulted in luteinization of the ovaries and progestational proliferation without the inhibition of the posterior pituitary reaction (Robson¹⁷⁵).

7. Prolan cannot induce a superovulation in the rat or mouse such as can be readily done with anterior pituitary implants (Shelesnyak and Engle¹⁹¹).

8. The dose of an anterior pituitary extract necessary to produce ovulation in rabbits is very much less than that of prolan when the potency of these two substances is standardized on immature female rats (Leonard^{116, 117}).

9. The administration of A.P.L. placental extract (McPhail, quoted by Collip²²) or a pregnancy blood extract (Fluhmann⁵⁵) for periods of three to four weeks produced a progressive increase in the ovarian weights of immature rats. With an anterior pituitary extract, at doses which stimulate increases of from 100 to 500 per cent in ovarian weight in the first five days, no further increase could be induced even when the daily injections were continued for twenty days (Fluhmann⁵⁶).

10. The administration of a known total dose of a pregnancy blood extract over periods of ten, fifteen, or twenty days produced a much greater increase in ovarian and uterine weights of immature rats than when the same total dose was given in five days. The opposite result was obtained with acid extracts of sheep anterior pituitary glands, as the injection of a known dose in five days produced a greater increase in ovarian weight than when the administration of the same total dose was spread out over periods of ten, fifteen, or twenty days (Fluhmann⁵⁷).

FURTHER OBSERVATIONS ON THE GONAD-STIMULATING HORMONE OF PREGNANT WOMEN

In addition to the data presented in the preceding section a number of important observations on prolan have been made, and until the relation between these hormones is more clearly understood they should be considered separately from the experimental results obtained with anterior lobe substances.

The demonstration by Friedman that ovulation may be induced in rabbits by the intravenous injection of pregnancy urine stirred up a great deal of interest, and a number of exhaustive studies have been conducted on various phases of this problem (Snyder and Wislocki,²⁰¹ Friedman,⁶⁰ Wolfe and Ellison,²³⁷ Jares,⁹¹ Hill and Parkes,⁷⁹ Winter²²⁵). Friedman^{61, 62} has succeeded in inducing ovulation unilaterally by the direct intrafollicular injection of pregnancy urine extracts. Reynolds¹⁶⁹ found that a small amount of the ovary-stimulating hormone from pregnancy urine may induce a transitory decrease in the motility of the uterus of the unanesthetized rabbit, and as in the case of the anterior lobe he believes that this is a direct effect on the uterus. Westman²¹⁹ was able to prolong the period of pseudopregnancy in the rabbit by the injection of prolan, and Fluhmann^{52, 53} has dem-

onstrated that during pseudopregnancy or after the injection of estrin the rabbit's uterus reacts to trauma with macrophages much more intensively than under normal conditions.

The injection of pregnancy urine extract to ten-day-old rats produced no important follicle development but an increase in the size of the ovaries due to a growth of interstitial tissue according to Dorfmueller and de Fremery,³³ while Selye and Collip¹⁸⁴ obtained in very young rats an extensive thecal luteinization and continuous estrus with the A.P.L. placental extract. Hill⁷⁶ found that larger doses of pregnancy urine are necessary to elicit a response in mice of fourteen than of twenty-one days of age. The production of thecal luteinization after the administration of prolan to guinea pigs has been described by Loeb,¹²⁹ Aron,⁴ Selye, Collip and Thomson,¹⁸⁵ and King.⁹⁹ Mandelstamm and Tschaikowsky¹³⁴ produced sterility in female mice by the administration of prolan, but Rosenblatt, Halber and Pruszycki¹⁷⁶ were unable to produce such hormonal sterilization in either mice or rabbits. Katzman⁹⁵ has pointed out that although the prolonged administration of prolan results in profound ovarian luteinization there is no permanent impairment of the reproductive mechanism, an observation corroborated by Zondek,²⁴⁵ Reiss,¹⁶⁴ and Reiss, Druckrey and Fischl¹⁶⁵ have reported that the basal metabolism (studied by Warburg's method) of ovaries stimulated to growth by prolan, increased markedly, and this increase was apparent before the morphologic changes set in. Zondek, Zondek and Hartoch²⁴⁶ have inhibited the growth of transplantable carcinoma in mice by the injection of prolan, while Gross⁶⁷ obtained a stimulation of the growth of a transplantable sarcoma and considered it a nonspecific effect. Küstner¹¹⁰ found that prolan was destroyed by exposure to ultraviolet rays and its activity was increased by red light, while Wirz and Goecke²²⁷ could not produce an intensification of prolan effects by unilateral oophorectomy of the experimental animal. Shelesnyak¹⁹⁰ produced deciduomas in young rats treated with pregnancy urine, and the effects of this hormone in adult mice have been studied by Hirsch-Hoffmann.⁸² Hill and Parkes⁷⁸ have found some indication of a separation of luteinizing and maturing activity by alcohol fractionation of urine extracts. Baq and Brouha⁵ found no interference with the action of pregnancy urine after sympathetic denervation.

Collier and Wade²¹ have presented one of the first studies on the characteristics of gonad-stimulating extracts made from the urine of human castrates and normal individuals, and reported a relation between the effects they induced and those brought about by prolan injections. Snyder and Wislocki²⁰⁰ were unable to demonstrate gonad-stimulating factors in the urine of pregnant macaque monkeys, rabbits, cats, rats, or dogs, and Bunster¹¹ could not induce ovulation in the rabbit by blood transfusions from pregnant does. Of especial interest, however, is the gonad-stimulating principle found in the blood of pregnant mares and further important observations on its effect in male and female rats, ewes and sows have been made by Cole, Guilbert and Goss¹⁹ and Cole and Miller²⁰ while Catchpole and Lyons¹⁵ have investigated quantitatively its distribution in maternal and fetal horse tissues.

TECHNICAL PROCEDURES

In view of the widespread interest aroused by problems dealing with the physiology of the hypophysis and the ovaries, it was inevitable that during the past two years many technical procedures facilitating or improving research activities should be presented. A method of performing hypophysectomy in the monkey has been described by Firor,⁴⁸ and Thompson²¹³ has presented a technic for this operation in the rat. Cleveland and Wolfe¹⁸ and Sevringhaus¹⁸⁶ have given new methods for the differential staining of the cells of the anterior hypophysis. Nu-

merous procedures have been devised for the preparation of ovary-stimulating extracts from anterior lobe tissue (Wallen-Lawrence and Van Dyke;^{214, 217} Wiesner and Marshall;²²³ Fevold et al.;⁴⁷ Evans, Simpson and Austin⁴⁵); from urine of pregnant women (Schmidt and Derankowa;¹⁸² Wiesner and Marshall;²²³ Wallen-Lawrence and Van Dyke;²¹⁷ Katzman and Doisy;^{96, 97, 98} Davy and Sevringhaus³⁰); from human placenta (Collip and coworkers;^{26, 27} Wiesner and Marshall²²³); and from blood of pregnant women (Neumann and Peter;¹⁴⁷ Fluhmann⁵⁴); while additional chemical data on various gonad-stimulating hormones have been presented by Spaul and Myddleton,²⁰³ Schmidt and Derankowa,¹⁸¹ Reiss, Schäffner and Haurowitz,¹⁶⁷ Marshall.¹³⁷

CLINICAL STUDIES

In a previous communication (Fluhmann⁵⁸) it was stated that three important advances in clinical work have resulted from these studies, namely, (1) the development of an important test for the diagnosis of pregnancy and the control of the treatment of chorioepithelioma and hydatidiform mole, (2) the employment of hormone tests as a new method of approach for the study of certain endocrinologic conditions, and (3) the use of ovary-stimulating hormones for the successful treatment of the uterine hemorrhages accompanying hyperplasia of the endometrium.

During the past two years numerous reports have appeared further corroborating the accuracy of the Aschheim-Zondek pregnancy test, and Friedman's modification calling for the use of rabbits has rightly become the most popular procedure at least in this country. A number of quantitative studies on the amount of prolan in the blood or urine during pregnancy have been reported. Brindeau, Hinglais and Hinglais⁸ have found a maximum concentration of prolan in the blood serum during the first trimester of pregnancy, while Runge, Hartmann and Sievers¹⁷⁸ found very little difference in the urinary excretion between early and late pregnancy although this amount may vary greatly during the course of gestation. Murphy¹⁴² noted that the variations in urine output do not influence the total amount of hormone excreted while Runge and Clausnitzer¹⁷⁷ observed a persistence of prolan excretion for some days after intrauterine fetal death. Winter²²⁴ reported a marked increase of prolan in the urine of a patient with a hypophyseal tumor complicating pregnancy.

A number of important clinical observations dealing with pituitary-ovarian interrelationship have been published. Cushing^{28, 29} has given an exhaustive study of pituitary adenomas and described the clinical manifestations of basophile adenomas including their relation to ovarian function. Siedentopf¹⁰² has cited an unusual condition in a woman who failed to menstruate in spite of a normal ovarian cycle, and since she developed uterine bleeding after treatment with prolan he considered this as evidence of a direct effect of the anterior lobe on the uterus. Burch et al.¹² considered the hypophysis involved in the etiology of hyperplasia endometrii, while Kraus^{103, 106} found a relation between cystic degeneration of the ovaries and prolonged increased intracranial pressure associated with an excessive production of anterior lobe sex hormone. Lambie and Wiesner¹¹¹ have given an extensive, complicated and certainly premature discussion of the relation between the hormones of the anterior lobe of the pituitary gland and clinical syndromes. Bennett⁶ has given the hormone findings in an instance of pubertas precox in a girl of four, while Koller¹⁰² found a hyperemia and increase of lutein tissue in the ovaries of a patient with a thrombophlebitis of the sinus cavernosus accompanied by an acute inflammatory condition of the anterior hypophysis.

In the two previous reviews of this series (Fluhmann^{50, 51}) analyses were made of reports dealing with the presence of ovary-stimulating hormones in the blood or urine of women with certain types of amenorrhea, following operative or radiation

castration, and in the postclimacteric period, and a number of papers have recently appeared corroborating these findings (Jeffcoate,⁹² Mazer and Andrussier,¹³⁸ Brühl,¹⁰ Österreichischer,^{154, 156} Zondek,²⁴³ Gostimirove,⁶⁴ Bompiani,⁷ Wirz²²⁶). Kurzrok^{107, 108} has made use of such a procedure along with estrin tests as an index of therapy in menstrual dysfunction. Neumann and Peter¹⁴⁸ found anterior lobe hormone in the blood of women (no details given) during the premenstruum, at which time Zondek²⁴¹ observed a maximum urine excretion, while Österreichischer¹⁵⁵ obtained a positive test in only 3 out of 60 observations in normal individuals. Katzman and Doisy⁹⁷ have made an important quantitative determination of the daily output of ovary-stimulating hormone in various individuals. Soeken²⁰² obtained positive tests from the urine of 24 out of 50 children, but Schöcherer¹⁸³ obtained negative results in 47 cases. Kaiser⁹⁴ found a positive Aschheim-Zondek test in a patient with a large parovarian cyst, Siegmund¹⁹⁶ in a six-year-old child with pubertas precox associated with a chorionepitheliomatous ovarian tumor, and Froboese and Zondek⁶³ in an infant with a large retroperitoneal teratoma. Considerable discussion has centered on the presence of ovary-stimulating hormones in the urine of patients with acromegaly, hypophyseal tumors, or cases with prolonged increase of intracranial pressure, positive results having been reported by v. Morgitay-Becht and Miklos,²¹⁵ Kraus,¹⁰⁵ and Hirsch-Hoffmann,⁸¹ but Watts,²¹⁸ and Fels⁴⁶ have obtained negative results. The latter believes that in such cases anterior lobe sex hormone is probably only found in the urine of patients with basophilic adenomas of the anterior hypophysis.

An interesting editorial in the *Lancet*³⁴ suggests that before ovary-stimulating hormones come into widespread clinical use, more information based on experimental work should be obtained. (It might be added that a more thorough understanding of the conditions treated would also be of assistance.) However, it would seem that the use of prolan for the treatment of uterine hemorrhage, and especially in patients with hyperplasia endometrii, has proved of value in a large percentage of cases and further evidence of this claim has been advanced by Novak and Hurd,¹⁵¹ Laquer,¹¹² Johnstone, Wiesner and Marshall,⁹³ Schildberg,¹⁸⁰ Campbell¹⁴ and others, while Clauberg¹⁷ has suggested the use of blood transfusion from pregnant donors, a procedure which should be of value in emergency instances. On the other hand, a perusal of reports regarding the use of prolan in "hypoovarian conditions" as manifested by amenorrhea, irregular delayed menses, and hypomenorrhea, leaves one with the impression that final judgment as to its true value should be delayed, some authors claiming a large percentage of cures, others almost total failures, and practically no one giving complete records of careful, well-controlled studies (Purpus,¹⁵⁹ Laroche and Simmonet,¹¹³ Johnstone, Wiesner and Marshall,⁹³ Schildberg,¹⁸⁰ Wiegels,²²² Gragert,⁶⁵ Sevringhaus and Thornton,¹⁸⁸ and others). Zondek²⁴⁰ has reported successful prolan therapy in a series of patients with pelvic inflammatory disease, and Fluhmann^{52, 53} has given a logical explanation for this method of treatment in the experimental demonstration of an increased macrophage response of the rabbit's uterus following hormonal stimulation with either prolan or estrin. Novak¹⁵⁰ and Novak and Reynolds¹⁵² have discussed the problem of dysmenorrhea and suggested the use of prolan for this condition, but Campbell¹⁴ reported that such symptoms are intensified by the administration of prolan (A.P.L. placental extract). Campbell¹⁴ has also found an alleviation of menopausal symptoms and mastalgia by the use of A.P.L. extract. Mandelstamm and Tschakowsky¹³⁵ have found characteristic changes in the ovaries of patients given prolan before operation, an important contribution which awaits confirmation.

In conclusion, reference must be made to two books dealing with various phases of this subject which have appeared in the last two years, and which deserve special commendation. In the first (Allen¹) the advanced student will find an authoritative

discussion of the subject as it stands to date by recognized American authorities, and in the second (Mazer and Goldstein¹³⁹) the practitioner will find a fundamental exposition of the relation of recent advances to clinical work which should prove of much assistance.

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Correspondence

ON THE EPITHELIAL AND GLANDULAR MODIFICATIONS OF THE CERVIX DURING PREGNANCY

I have read with much interest the article by Prof. Hofbauer in the June, 1933, issue of the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY on the manifestations of hyperplasia in both the surface mucosal epithelium and the glandular epithelium of the cervix in pregnant women.

Hofbauer states that, as far as he has been able to determine, these manifestations were hitherto unknown. He adds that his findings "may offer a new avenue of approach to the problem concerning the occurrence of cervical cancer in women who had previously been pregnant."

I want to take this opportunity to call attention to the fact that in 1910 (*Annali di Ostetricia e Ginecologia*) I made a systematic investigation into the histology of the cervix uteri during pregnancy.

I examined 90 cases, in all the different months of pregnancy, and studied separately the modifications of the connective tissue (decidual reaction), of the surface mucosal epithelium and of the glandular epithelium. I found deep modifications very similar to the ones described by Hofbauer. I had also reproduced several pictures of sections that closely resemble the beautiful photomicrographs of Hofbauer.

In 1927 I had these studies taken up by my assistant, Dr. Revoltella, who also studied carefully the histologic modifications during puerperium (*Rivista Italiana di Ginecologia*, 1927 and 1928).

In what concerns the pathogenical relations with cancer, I said in my papers of 1910, that the pregnancy modifications were like initial malignant lesions; however, I emphasized the fact that this had no pathologic significance, although there was little difference between them and the epithelial or glandular neoplasia. Moreover I saw in the tendency of pregnancy to determine epithelial atypical proliferations a new reason, hitherto unknown, that explains the predisposition of the multiparous women to cancer of the cervix. This hypothesis I worked up several times (*La Clinica Ostetrica*, 1928, 1933) and had it repeated by my assistants Cetroni and De Candia (*La Clinica Ostetrica*, 1929, 1932).

It is to be recognized that this is only a hypothesis. I desire however to establish the Italian priority as regards these objective histologic findings. The latter are interesting in themselves and ought to be further studied. I shall reserve for myself the pleasure of studying more accurately Hofbauer's new hypothesis concerning the relations with the hypophysis, and cancer prophylaxis, as well as other histologically interesting points of Hofbauer's work.

BARI, CLINICA GINECOLOGICA
JULY 7, 1933

PROF. PAOLO GAIFAMI.

A REPLY TO THE FOREGOING BY DR. HOFBAUER

It goes without saying that previous to the publication of our work on epithelial proliferation in the pregnant cervix, we went over the literature very carefully. Our modern standard textbooks of obstetrics, both in this country and abroad, do not mention any epithelial changes in the cervix during pregnancy. We also consulted Prof. R. Schroeder's recent comprehensive monograph *Weibliche Genitalorgane* (in *Handbuch der mikroskopischen Anatomie des Menschen*, von v. Möllendorff 7: part 1) and failed to find any statement relative to this subject. In Prof. Robert Meyer's book on *Histology and Pathology of the Female Sex Organs* (in *Handbuch der speciellen pathologischen Anatomie und Histologie*, 1930, vol. 7, part 1), there is a short note (p. 181) to the effect that during the second half of gestation Gaifami found paved epithelium ("Plattenepithel") in 42 per cent of his cases. This finding did not seem to me to have any bearing on our investigations.

Prof. Gaifami very kindly sent me, a few days ago, a reprint of his article. For this favor I feel much obliged to him since the Italian journal in which this article had appeared (in 1910) was not accessible to us; nor does the *Zentralblatt für Gynäkologie* contain an abstract of his work.

Our microphotographs and descriptions trace the beginning of the epithelial proliferation in the gravid cervix to the *third* month and show its mode of production. Furthermore, we place emphasis on the *penetration of the proliferating epithelium into abnormal locations*, inroads on connective tissue spaces, and on the *occurrence of dividing figures* in the proliferating epithelium, and also on *heteroplasia*. These particular changes are of blastomatoid character. It is our paper which described *these* phenomena for the first time.

Much as I admire Prof. Gaifami's initiative to correlate his findings with the possibility of later development of cervical cancer, so poignantly expounded in his articles, I did not dare to assume a dogmatic attitude in my more detailed paper. On the other hand, in a forthcoming experimental study the production of pre-cancerous lesions in the uterine cervix by hormonal stimuli will be demonstrated. Acknowledgment of these findings by no less an authority than Dr. James Ewing lends color to this new phase of studies in the realm of etiology of cervical cancer.

BALTIMORE, MD.
AUGUST 25, 1933

I. HOFBAUER, M.D.

Department of Book Reviews

CONDUCTED BY ROBERT T. FRANK

Reviews of New Books

GYNECOLOGY

(Continued from October issue.)

The book written by Kappis on the *Prophylaxis and Treatment of Operative Dangers*⁸ is well worth while. It assembles and digests much of what is known on these subjects, with full regard to our increased knowledge in normal and pathological physiology and biology. The surgical profession should be grateful to the author for his laborious work and for having assembled within the covers of one book what is generally known of this field which may be summed up under the resistance to versus the dangers of operation.

Of operative deaths 45 to 55 per cent are due to the underlying diseases as for example, carcinoma, peritonitis, severe injuries. Of possibly avoidable risks, pneumonia, bronchitis, lung abscesses, etc., take 17½ per cent of victims. In accord with others, the author finds an increase of thrombosis and embolism. His mortality from these unavoidable accidents in 1923 was 1.6 per cent; in 1930, 8.6 per cent; in 1931, 6.5 per cent. General poor condition causes 9 to 14 per cent of deaths as for instance the cachexia seen in carcinoma of the stomach. In addition, deaths are due to infection, especially peritoneal, mistakes in diagnosis or wrong indications. At least 1 per cent of deaths are due to cerebral hemorrhages and some remain undetermined even at autopsy.

A large amount of space is devoted to the preoperative evaluation of the risk in which constitution, age (both young and old), intercurrent physiological conditions such as menstruation and pregnancy, diseases including Basedow, Addison's disease, thymolymphatic status, etc., play a considerable rôle. Certainly in selected cases, functional heart tests, careful examinations of the lung, determination of the liver function, of kidney function, of blood disturbances, and changes in the basal metabolism must be thoroughly considered.

Dangers incident to the operation itself and immediate sequelae are next taken up, including the selection of the anesthetic, immediate preoperative preparation, care to be taken against leaving foreign bodies in the wound. Even such apparently minor matters as the avoidance of injury in giving injections either subcutaneously or intravenously, are discussed in detail. The avoidance of operative shock and collapse, as well as their treatment are fully discussed. Deaths on the operating table, air embolism, intracardiac injections and cardiac massage are described.

The next division concerns itself with after-treatment. The author believes in carefully graduated but sufficient morphine injections postoperatively. He then takes up such matters as loss of fluids, feeding, movement of the bowels, the

⁸*Vorbeugung und Bekämpfung der Operationsgefahren.* Von Prof. Dr. M. Kappis Georg Thieme, Leipzig, 1933.

avoidance and treatment of cardiac, pulmonary and other complications as well as alkalosis, tetany, singultus, parotitis, psychoses, etc. A concluding portion of this division deals with the after-treatment of special areas after operations on the head, face, thorax, breasts, abdomen, etc. This book of over 375 pages contains a fund of information, impartially and clearly expressed.

R. T. FRANK.

Referring to the fact that the majority of gynecological patients begin their careers, so to speak, in the office of a private practitioner and that many of them must eventually be treated by special apparatus or handled with an unusual degree of skill by the gynecologist, Küstner⁹ feels that the most important division of gynecology is early and exact diagnosis. In obstetrics, as well, he regards pre-knowledge of abnormalities, possible complications and early recognition of pathological conditions a *sine qua non*. To this end he has compiled in table form the diagnostic points in a series of gynecological and obstetrical conditions. These tables are supplemented for the most part by beautifully colored plates or very capably executed black and white drawings correlating the tables.

For gynecology he has arranged thirty-six tables beginning with malformations and congenital deformities of the urogenital system, continuing through inflammations, tumors, displacements, diseases of the tubes and ovaries, peritonitis, fistulas and gonorrhea. The tables vary in length and breadth as to the number of conditions which may affect a certain part. Symptomatology, etiology, pathology, bacteriology, clinical course, differential diagnosis, prognosis and changes in function are given.

Obstetrics begins with diagnosis, continues through abortion, and positions of presentation. Four charts on the toxemias, complications of labor, puerperal sepsis and diseases and injuries of the newborn are included.

Such a manner of presentation, stripped of nonessentials, will give to the practitioner a quick and striking picture to assist him in making an early and exact diagnosis.

PHILIP F. WILLIAMS.

The fifth edition of v. Jaschke and Pankow's *Lehrbuch der Gynäkologie*¹⁰ is a large volume of 759 pages, costing 40 marks. Nine years have elapsed since the last edition was published. The two authors represent a continuation of the clinics of v. Rosthorn and of Krönig. The book is designed mainly for the student and practitioner. Debatable subjects and subjects of special interest to the specialist are not emphasized. Consequently operative technic is only dealt with in a most summary fashion. On the other hand, the connection between gynecology and general medicine is emphasized throughout.

General gynecology is dealt with in 262 pages, while the pathology and therapy occupies 460 pages of the volume.

The anatomy is short but good. The same may be said of the embryology and physiology. Next the hygiene of the female and woman as a patient, are discussed.

The treatment of functional and allied conditions by means of hormone therapy is, to say the least, over-enthusiastic and uncritical.

The second portion of the book is well written, informative, but rather difficult to read as it is too ample for the student and too general for the specialist. In

⁹*Gynäkologische und Geburtshilfliche Diagnostik in Tabellenform.* Von Professor Dr. Heinz Küstner. 65 Tabellen mit 72 farbigen und schwarzen Abbildungen. J. F. Lehmann, München, 1932.

¹⁰*Lehrbuch der Gynäkologie.* Von Dr. Rud. Th. v. Jaschke und Dr. O. Pankow. Fünfte Auflage. Verlag von Julius Springer, Berlin, 1933.

discussing diathermia, hydrotherapy and radiotherapy, so many details are included that it must be bewildering to the beginner.

The illustrations are especially good, well selected and well executed. Considerable literature in the form of footnotes adds value to the book although in the vast majority of cases only the German literature has been taken into account.

R. T. FRANK.

OBSTETRICS

*Ten Years of Obstetrics and Gynecology in Private Practice*¹¹ has been offered largely to furnish a series of private cases for comparison with hospital statistics. The statistical summaries will undoubtedly be useful in such comparative deductions.

The text is divided into two parts, obstetrics, regarding 1750 cases, and gynecology, discussing 1345 cases with 1783 diagnoses. This material has been arranged in groups with figures, comments and in some instances, for the purpose of illustration, detailed case histories.

As all scientific and controversial matter is omitted, the book will be found entirely clinical and eminently practical. The reduction of complications as noted in the first chapter stresses the importance of good prenatal care. Simple measures sufficed for most vomiting of pregnancy cases, but one therapeutic abortion was done. Grave vomiting in advanced pregnancy with toxic degeneration of the liver is well discussed, and a characteristic history appended. The Voorhees' bag for lateral, and cesarean section for central placenta previa are recommended. No mention is made of transfusion or of packing after delivery in placenta previa or in premature separation of the placenta, although the author mentions (p. 21) that postpartum hemorrhage is a frequent and dreaded complication in the latter. Transfusion appears in the index but by a typographical error evidently refers to a wrong page.

The author treats his toxemias conservatively and is prompt in terminating pregnancy in the presence of a threatening eclampsia. Cardiac complications are very briefly discussed. There is no mention of the Wassermann reaction in the cases of unusual edema of the fetus and placenta. Decomposition and extraction of frank breeches is done at once on full dilatation. The author discusses the relative merits of episiotomy and of "ironing out the perineum" and is preferring the former. Medical induction was found useless and rupture of the membranes and insertion of a No. 4 Voorhees' bag routinely practiced. A delivery table with elevator lower section, and roller top section is described and illustrated. The old-fashioned stirrups are seemingly used in operative deliveries. Discussing analgesia and anesthesia the author believes the danger of morphine to the newborn is overrated. Perineal repairs are performed under infiltration anesthesia, novocain.

There were 431 instrumental deliveries in the 1750 cases. The modern tendency toward earlier interference is supported. Low or Simpson forceps were used 207 times, axis traction in 29, and Kielland in 195 cases. The author is enthusiastic over the Kielland forceps and devotes six pages to their use. In contrast podalic version receives a scant page. The vectis is resurrected. Ninety-five cesarean

¹¹*Ten Years of Obstetrics and Gynecology in Private Practice*. A clinical report of 1750 obstetrical and 1345 gynecological cases, with comparative analyses of many of the larger groups, and detailed case histories of some of the more important and less common conditions. By John L. Rothrock, A.B., M.D., F.A.C.S. Formerly Associate Professor of Obstetrics and Gynecology, University of Minnesota; Former Member of the Miller Clinic and Chief of the Obstetrical and Gynecological Services of The Charles T. Miller Hospital. Pages 204, and 9 illustrations. Paul B. Hoeber Inc., New York, 1933.

sections were performed in the series. In 10 per cent the indication was relative. In 44 cases the extraperitoneal operation was done, almost evenly divided between elective and emergency. The morbidity rate was unusually low and there were but five maternal deaths in the series. Consideration of the fetus concludes the obstetric section. The author makes the observation that private patient babies average heavier than ward service babies.

The second part of the book deals with private gynecology over the same ten years. The author stresses the importance of sufficient preoperative treatment of the cervical infections before any plastic work is undertaken. Prophylactically radium is used at the time of the diagnostic curettage. The ovarian function is always conserved when possible. The rôle of the appendix in the etiology of right sided pelvic inflammation is discussed. A modification of the Alexander operation for retrodisplacement of the uterus is practiced. The abdomen is always opened during the operation. Only two endometriomas of the ovary were encountered. Contrary to some authorities, curettage of the uterus, when a cervical polyp is removed, is advised against. The author noted but little change in the type of menopause whether ovaries are conserved or are removed in hysterectomy for fibroids. Radiation followed by radical operation where possible is practiced in carcinoma of the cervix. Two recurrences after a five-year cure are noted, as well as the occurrence of a second primary carcinoma eight years after the removal of the first. Under some miscellaneous case reports is recorded a recovery from tetanus following a vaginal hysterectomy, 335,000 units of antitoxin were used. There was an operative mortality of 0.38 per cent in 1268 patients.

Written with a very personal touch in the maturity of a professional life the book reflects the experience and judgment gained in years of trials and experiment, and emphasizes the methods and operative procedures which the author has found of proved value, as shown by his admirable results.

PHILIP F. WILLIAMS.

Thoms has written a fascinating brochure entitled *Chapters in American Obstetrics*.¹² He describes the early American midwifery in a most vivid fashion. Then he takes up the first obstetrics published in America by Samuel Bard, 1807. The introduction of ergot into obstetrics by John Stearns, under the name of "pulvis parturiens," is of interest. Among other well-known figures, William Potts Dewees and Oliver Wendell Holmes are pictured. A chapter on cephalic version introduced by M. B. Wright and in conclusion the introduction of ether in childbirth by Walter Channing, are given.

Thoms has succeeded in putting life and color into these historical sketches to a degree which should induce even readers not particularly interested in medical history to read these pages with pleasure, profit, and a feeling of pride for what the early American obstetricians have done.

R. T. FRANK.

The usual comparative studies in Embryology and Cytology have been discarded by Lucien and Vermelin in their *Treatise on the Human Ovum*.¹³

The first part of the book is devoted to Spermatogenesis and oögenesis from the origin of the germinal gland in the embryo to the fully matured adult cells

¹²*Chapters in American Obstetrics*. By Herbert Thoms. C. C. Thomas, Springfield, 1933.

¹³*L'Oeuf Humain et ses Annexes Par Maurice Lucien*. Professeur d'anatomie et Henri Vermelin, Professeur agrégé d'obstétrique à la Faculté de Médecine de Nancy. Preface du Professeur Couvelaire, Membre de l'Académie de Médecine. Pages 158; and Avec 78 figures. G. Doin & Cie, Paris, 1933.

capable of union. A note on sterility makes practical use of their observations. There is a full exposition of the sexual cycle completely in accord with the most recent anatomical and physiological researches, references to which are frequent. The rhythmic cycle of the fallopian tube, shedding of cilia, granulation of cells, and hemorrhage following closely the uterine cycle is described, as is also the vaginal cycle.

The physiology of nidation, its variants, including multiple pregnancy and the associated phenomena are discussed. The manner and time of development of the appendages, membranes and placenta and the physiological significance, for the embryo, from a nutritional aspect are given fully. The very early human ova and embryos reported in the literature since Peter's ovum are listed and classified as to development. The final chapter takes up the circulatory mechanism.

This assembly of facts, by an anatomist and an obstetrician, is a good basic statement of the present status of human embryology, and will make an excellent reference book.

PHILIP F. WILLIAMS.

De Lee's *Obstetrics*¹⁴ continues to be one of the outstanding contributions on this subject in the English language. Since 1913, it has gone through six editions, each with careful changes to keep it up to the present state of our knowledge, and a number of reprintings in addition.

This new edition is a volume of 1165 pages and contains many changes as well as a number of new illustrations. De Lee has more and more taken cognizance of two methods of delivery, the one, strictly hospital in the hands of specialists, and most often applied to the abnormal cases; the other, in the hands of the general practitioner where delivery is performed in the home, which requires an entirely different viewpoint and much more noninterference.

De Lee divides eclampsia into true toxemia, acute nephritis, chronic nephritis and malignant hypertension. As the cause of this symptom complex is unknown, his classification is as acceptable as any other. He believes in allowing the patient to deliver herself.

A careful review of borderline conditions, involving problems of internal medicine, has been performed, including tuberculosis, diabetes, heart disease and syphilis.

The frequent use of illustrations based on motion picture films is employed. These would be more useful if the pictures were larger.

The literature has been kept up to date.

As heretofore, this volume is of great value both to the practitioner and obstetrician because of the immense experience recorded in its pages as well as the meticulous care employed in constant revisions.

R. T. FRANK.

This medium-sized volume on *Practical Obstetrics*¹⁵ admirably fulfills the aim of the author to produce a text midway between a complete reference book and a compendium. Stripped of any unnecessary verbiage and omitting all scientific discussion, the present-day ideas and practice are given, concisely and succinctly, in well-spaced chapters, with plenty of excellent illustrations. It is a suitable book for the student days or the years of early practice, and has a simplicity of presentation

¹⁴*The Principles and Practice of Obstetrics.* By Joseph B. De Lee. Ed. 6, W. B. Saunders Co., Philadelphia, 1933.

¹⁵*Lehrbuch der Praktischen Geburtshilfe für Studierende und Ärzte.* Von Prof. Dr. Sigfrid Hammerschlag, Direktor der Brandenburgischen Landesfrauenklinik in Berlin-Neukölln. Seite 290: mit 101 teils farbigen Abbildungen. Ferdinand Enke, Stuttgart, 1933.

similar to some recent American manuals and introductions. There is little to criticize in the text and the conservative practice recommended should meet with much approval.

PHILIP F. WILLIAMS.

The obstetric conditions in the tropics which are materially different from those of the West in respect to anatomy, climate, and diet are described in this book by Green-Armytage dealing with *Midwifery in the Tropics*.¹⁶ It has been written not only for the Indian student but for the medical man, with a western education, beginning practice in eastern or tropical countries. The subject matter follows the usual divisions of the average textbook, and is presented in a crisp, staccato style, a concise form to help students to whom English is indeed a foreign language.

Among the racial differences it is noted that the head of the oriental fetus measures a quarter of an inch less in all important diameters, than the European fetus; that the generally contracted, round inlet, pelvis is quite common in India and the funnel pelvis is very common. As osteomalacia and rickets are frequent diseases in India all varieties of contracted pelvis are often seen.

The average maternal mortality is 4 per cent, and complications occur in 20 per cent of the cases. Lack of prenatal care is practically universal in India; the authors supply excellent rules for antenatal and postnatal care, the chapter on the latter is especially good. A dietary for Europeans resident in India is listed as well as one for natives. This has been drawn up with a view to lessening the many complications which may be referred to dietary deficiencies. The authors are conservative in their treatment of toxemias. They refer to an unusual frequency of pelvic abscess following ectopic pregnancy, whether operated upon or not.

Among the tropical conditions quite fully discussed are the anemias of pregnancy, frequent and severe, and a cause of much morbidity and mortality, malaria, kala-azar, tetany, dysentery, osteomalacia in its various stages. They find morbid changes occur quite early in multiparas, a para iv often being a greater problem than in her first pregnancy and delivery, all due to tropical habits and diseases. Fifty per cent of puerperal pyrexias are due to tropical disease, and at times the differential diagnosis of sepsis is difficult. Cesarean section occurs once in every forty cases in the Eden Hospital. The authors state that, having given the Kielland forceps an extended trial they do not recommend it.

The few illustrations used demonstrate cephalopelvic disproportion. A graphic chart is used to bring out all the points of antenatal care. The book is a very good manual on obstetrics, and is interesting in its portrayal of the manifold difficulties under which obstetrics is practiced in India.

PHILIP F. WILLIAMS.

A most interesting subject was taken up by the Ukrainian Congress of Obstetrics and Gynecology at Kiew, dealing with the experience resulting from the *Liberalization of Inducing Abortion in the Soviet Republic*.¹⁷ The subject has been considered of such interest that the German *Gesellschaft für Geburthilfe und Gynäkologie* instructed Professor A. Mayer of Tübingen to supervise the trans-

¹⁶*A Textbook of Midwifery in the Tropics*. By V. B. Green-Armytage, M.D., F.R.C.P. (Lond.), F.C.O.G., Lt.-Col., I.M.S., Chevalier of the Legion of Honour; Order of the White Eagle of Serbia; Professor of Midwifery and Gynecology, Calcutta Medical College, and Surgeon to the Eden Hospital for Women, Calcutta, and P. C. Dutta, M.B., F.R.C.S., D.G.O., Captain I.M.S. Pp. 282; 7 Illustrations and 1 Chart. The Book Company, Ltd., Calcutta, 1933.

¹⁷*Erfahrungen mit der Freigabe der Schwangerschaftsunterbrechung in der Sowjet-Republik*. Herausgegeben von Professor Dr. A. Mayer, Universitäts-Frauenklinik in Tübingen. Verlag von Ferdinand Enke, Stuttgart, 1933.

lation and bring out this study in the form of a monograph which appeared as a supplement to the *Zeitschrift für Geburtshilfe und Gynäkologie* (Volume 104).

The Ukrainian Congress met in 1927. The report contains many independent papers which deal with the social indications for induction of abortion, the limitation of abortion to the first three months of pregnancy, the reasons for inducing abortion. The main indication appears to be economic stress which in most instances has been determined by a Commission.

At first, certain hospitals were indicated as "Abortaria" but later, when the bed capacity was found insufficient, private clinics were permitted to accept patients for this purpose. There has been a steady increase in induced abortions since 1913. Of the patients seeking abortion, there is some difference in different committees, but in general up to 80 per cent of them are married.

In consequence of the liberalization, charlatans and lay abortionists have greatly decreased. In spite of the diminution of clandestine abortions and the fact that the procedure is entirely in the hands of the medical profession, the medical dangers appear to be ever present, including infection, injuries, and many others.

From 1922 to 1926 the number of all abortions rose from 53 to 80 per cent of births in the city of Moscow. This percentage included likewise an increase of induced abortions from 12 to 26½ per cent. The various techniques which apparently are far from being standardized were discussed by different speakers. Some stress was laid on contraception as a proper means of limiting the necessity of abortion. As yet, no political or economic change in the incidence of population has been noted.

The Congress adopted resolutions in which it noted that there was an increase in the number of induced abortions both in the cities and in the villages; that there was a marked decrease in clandestine abortions with a definite decrease in morbidity and mortality; as yet no decrease in the number of the population has been shown; that the medical dangers had not decreased.

Hence the procedure should be limited to hospitals and trained medical men, and that because of the dangers in inducing abortion, the use of contraceptives is greatly favored.

R. T. FRANK.

*The Law Against Abortion*¹⁸ by William J. Robinson is frankly propaganda. No one who knows the life of the author can doubt his bona fides and yet some of its contents is, to say the least, startling. The whole basis of the book, as stated in the first chapter, is the demand for complete and total abrogation of any law against abortion. Robinson is strongly in favor of contraception or prevention, as he calls it. He acknowledges that abortion is an evil, but a necessary one.

This tract is cleverly written in flamboyant style but contains many well worth-while truths. The point of view and overemphasis will startle and antagonize many readers.

R. T. FRANK.

Briquet's *Operative Obstetrics*¹⁹ should be exceedingly valuable to those interested in obstetrics, if only for its beautiful format and illustrations. Although the author's

¹⁸*The Law Against Abortion. Its Perniciousness Demonstrated and Its Repeal Demanded.* By William J. Robinson. The Eugenics Publishing Co., Inc., New York, 1933.

¹⁹*Paul Briquet: Obstétrica Operatoria.* (Portuguese.) First and Second Editions. Companhia Editora Nacional, 1932, Sao Paulo, Brazil.

views may not be universally acceptable, the clearness of presentation as well as the soundness evidenced in the handling of commoner obstetrical procedures should more than make up for its deficiencies. Among the latter may be mentioned a relatively small bibliography which limits discussion of various questionable maneuvers considerably. The chapter on anesthesia consists largely of a discussion of anesthesia by the spinal route with many pages devoted to the technique. Anesthesia à la reine and local analgesia are touched upon but there is no mention of Gwathmey, avertin, pernocton, sodium amytal, or even morphine. Laudable chapters on the handling of postoperative complications as well as the newer metabolic concepts are appended. The book is greatly in need of proof reading and correction, a defect which will doubtlessly be rectified in subsequent editions.

FRANK SPIELMAN.

Only the very common obstetrical procedures are discussed in this relatively short book on *Obstetrical Operations*.²⁰ Almost half of it is devoted to a consideration of forceps alone and the discussion of the different types with their indications is gone into at considerable length. It is interesting to see the great variety of instruments still in use. The author in one of his illustrations shows 44 different models, and to these many more might be added. With the emphasis placed on forceps, there is little room for other subjects. Version, embryotomy, symphysiotomy, cesarean section, and hysterectomy are the only other procedures covered, and although the bibliography is extensive the discussion is limited. The illustrations could be greatly improved. The value of this book, in the main, lies in its thorough consideration of the use of forceps.

FRANK SPIELMAN.

This small *Manual on Prenatal Care*²¹ is evidently filling its niche, as the first edition was reviewed only two years ago. In this revision a description of the Aschheim-Zondek test for pregnancy is added and its use is further mentioned under missed abortion and chorionepithelioma. A chapter has been added on postnatal care which is timely, as such attention truly complements prenatal care. A good outline is given on the various conditions which may be met with; the examination and treatment of minor ailments is discussed. Long continued postnatal care of toxemic and other complicated cases is highly recommended. No mention is made of contraceptive advice.

Of interest is a short section on Maternity and National Health Insurance Benefits. In England the Factory Act prohibits a woman from working for four weeks after delivery, but nothing prevents her from working up to the actual day of her confinement.

The further additions and revisions in the text serve to keep the book an excellent guide in caring for the pregnant woman.

PHILIP F. WILLIAMS.

²⁰*Manobras e Operaciones Obstetricas*. Perciro de Camargo, J. (Portuguese.) Imprensa Nacional, Rio de Janeiro, Brazil, 1932.

²¹*Antenatal Care Including the Abnormalities Associated With Pregnancy and a Section on Postnatal Care*. By W. F. T. Haultain O.B.E., M.C., B.A., M.B. (Camb.), F.R.C.S.E., M.R.C.P.E., M.C.O.G. Senior Assistant Obstetric Physician and late Special Assistant to Ante-Natal Department, Edinburgh Royal Maternity Hospital and E. Chalmers Fahmy, M.B. (Edin.), F.R.C.S.E., M.R.C.P.E., M.C.O.G., Assistant Obstetric Physician and Special Assistant to Ante-Natal Department Edinburgh Royal Maternity Hospital, with foreword by Professor R. W. Johnstone C.B.E., M.A., F.R.C.S.E., F.C.O.G., M.R.C.P.E. Professor of Midwifery and Diseases of Women, University of Edinburgh. Second Edition. Pp. 121: 3 Illustrations and 5 Charts. New York, William Wood and Company, 1931.

Corkill's work on *Midwifery and Infant Care*²² is based on lectures to midwives and graduate nurses which the author has given for a number of years, and is offered as a working manual for handling obstetrical cases alone or as an assistant to a physician. The primary aim of the book has been to elaborate the rules and regulations of the New Zealand Department of Health, and the Midwives' Registration Board, for the purpose of reducing the dangers of infection during labor and the puerperium. An aseptic technique has been standardized throughout the hospitals of New Zealand by the Department of Health. This standard is presented and reasons given for every step recommended. As a matter of note, puerperal sepsis is no longer the chief cause of maternal mortality in that Dominion.

The plain and simple language of the book and the full explanations should make it a very good manual for the preclinical obstetrical course for a medical student. Practical demonstrations in minor laboratory work and antenatal care are given for the benefit of the midwives who evidently constitute a group entirely dissimilar from our conception of midwives. Chloroform seems to be the anesthetic choice in New Zealand. Rickets is rarely seen.

Several chapters are devoted to the infant, emphasis being placed on breast feeding, but with full details for artificial feeding. The end of each chapter has a concise summary, with rules of responsibility to the patient and the physician.

The author states that under certain circumstances in placenta previa the midwife may rupture the membranes or even insert a vaginal pack. To avoid unnecessary consultation calls by the midwife the author has devoted considerable space in explaining the various causes of delay in labor.

Throughout the book the emphasis is laid on the prevention of sepsis and an appendix is devoted to the Department of Health rules for disinfecting of rooms and equipment used in infected cases.

The caliber of the instruction seems unusually complete for midwives and graduate nurses until one realizes that for the most part these are women of unusual training and must carry on many complicated labors alone.

PHILIP F. WILLIAMS.

The tenth edition of De Lee's *Obstetrics for Nurses*²³ has been brought up to date. Besides the general nurse, it aims to teach the advanced nurse and teacher of nurses as well as the pupil nurses themselves.

Particular notice is given to obstetrics in the home as more than 50 per cent of all deliveries occur outside of hospitals.

The book is a very well-balanced description of obstetrics for nurses and shows the known qualities of De Lee as a teacher and experienced clinician.

R. T. FRANK.

This volume of almost 500 pages contains the chairman's report and the following 22 studies, mostly in monographic form, of *Factors and Causes of Fetal, Newborn, and Maternal Morbidity and Mortality*.²⁴ Acute Infectious Diseases in Pregnancy, Labor and the Puerperium by Dr. J. P. Greenhill of Chicago; Syphilis and

²²*Lectures on Midwifery and Infant Care*. A New Zealand Course. A practical manual on management of pregnancy and labour and the care of the infant, conforming with the syllabus laid down by the Nurses and Midwives' Registration Board of New Zealand. By T. F. Corkill, M.C., M.D., M.R.C.P. (Ed.), Lecturer to Nurses and Midwives' Registration Board of New Zealand; Senior Honorary Physician, Wellington Children's Hospital; Honorary Physician to Truby King-Karitane Hospital, Wellington; Member of the New Zealand Obstetrical Society. Pp. 410. Coulls Somerville Wilkie, Ltd., Auckland, New Zealand, 1932.

²³*Obstetrics for Nurses*. By Joseph B. De Lee. Ed. 10, Thoroughly Revised. W. B. Saunders Co., Philadelphia, 1933.

²⁴*Fetal, Newborn, and Maternal Morbidity and Mortality*. Report of Sub-Committee 4 of Section I, B of the White House Conference on Child Health and Protection. Hugo Ehrenfest, M.D., Chairman. D. Appleton-Century Company, New York, 1933.

Pregnancy by James Robert McCord of Atlanta; Pulmonary Tuberculosis in Pregnancy by Dr. Otto H. Schwarz of St. Louis; Parasitic Infections Complicating Pregnancy by Dr. Ernest Carroll Faust and Dr. Edward Lacy King of New Orleans; Heart Disease and Pregnancy by Dr. William W. Herrick of New York City; Nephritis Complicating Pregnancy by Dr. John W. Harris of Madison; Toxemia Problem by Dr. George W. Kosmak of New York City; Diseases of the Teeth and Gums in Pregnancy by George H. Wandel, D.D.S., of Chicago; Uterine Cancer and Pregnancy by Dr. John A. McGlinn of Philadelphia; Diseases of Endocrines and of Blood Complicating Pregnancy by Dr. Robert D. Mussey of The Mayo Clinic, Rochester; Induction of Labor With Special Consideration of Artificial Rupture of Membranes by Dr. Alan F. Guttmacher of Baltimore; Forceps and Cesarean Section by Dr. E. D. Plass of Iowa City; Anesthesia and Pain Relief in Obstetrics by Dr. Carl H. Davis of Milwaukee in cooperation with Drs. A. B. Bill, John W. Harris, Arno B. Luckhardt and Ralph M. Waters; Fever in the Puerperium by Dr. W. E. Caldwell of New York City; Non-Febrile Complications of the Puerperium by Dr. William C. Danforth of Evanston; Proper Postpartum Care by Dr. Charles Edwin Galloway of Evanston; Influence of Maternal Pelvic Therapeutic Irradiation on the Health of the Subsequent Child by Dr. Douglas P. Murphy of Philadelphia; Fetal Mortality in Breech Presentations by Dr. William Emery Studdiford of New York City; Relation of Birth Trauma to Neonatal Mortality and Infant Morbidity by Dr. Hugo Ehrenfest of St. Louis; Immediate Care of the Newborn by Dr. Joseph L. Baer of Chicago; The Importance of Complete and Accurate Certificates of Birth and Death in the Prevention of Maternal and Early Infant Mortality by Dr. Richard A. Bolt of Cleveland; Abortion in Relation to Fetal and Maternal Welfare by Dr. Fred J. Taussig of St. Louis.

In fairly systematic form for all the more common diseases found in pregnant women, the effect of pregnancy on the usual course of the disease is discussed, and as well the influence of the disease on the course of pregnancy and on the fetus in utero. The problems of prevention and of interruption of pregnancy in the interest of the mother are discussed in detail with due consideration of special methods of delivery required under certain conditions.

This full list of articles contained in the volume and of the competent men contributing them, better than any detailed description of their rich contents, will furnish an adequate idea concerning the immense practical value of this book for the obstetrician and especially for every practitioner doing obstetric work.

GROVER LIESE.

This exhaustive *Study of the Female Pelvis*²⁵ covers the subject from every possible angle. The scientific side of the problem has not been permitted to overshadow the practical aspect and a full clinical consideration is presented, with the author's ideas often elucidated by appropriate case histories. The book is profusely illustrated. There are many photographs showing the clinical application of the directions prescribed for pelvimetry and cephalometry, and a number of clear and distinct roentgenograms.

The historical review portrays in a sense the history of obstetrics. The racial differences shown in the widely gathered ethnological studies have a practical importance in our international population trend. One can agree with the author that the average native white female pelvis in private practice is smaller than the standard set by the American Committee. The far-reaching influences in

²⁵**The Pelvis in Obstetrics.** A Practical Manual of Pelvimetry and Cephalometry Including Chapters on Roentgenological Measurement by Julius Jarcho, M.D., F.A.C.S., Consulting Gynecologist, Hastings Hillside Hospital; Attending Obstetrician and Gynecologist, Sydenham Hospital. Pages 325, 140 Illustrations, 51 Tables. Paul B. Hoeber, Inc., New York, 1933.

the development of the abnormal pelvis are well presented; in these the effects of modern civilization and its corrolaries have had their part.

The classifications enumerated are based upon changes in form, etiology, and degree of deformity. Each is discussed with explanatory remarks. The author notes several varieties of the funnel pelvis, a deformity which has been well studied by American obstetricians.

Methods of external and internal pelvimetry are considered from the standpoint of their practical application. The various instruments suggested are pictured and their use described. The author feels that simple methods, intelligently employed, give just as valuable information as some of the complicated devices recommended. The diagnosis of cephalopelvic disproportion, which is the crux of the whole problem, is the subject of a very able chapter. The author favors elective cesarean section in most borderline cases. Those uncertain of obstetric diagnosis may study this chapter with profit.

The book concludes with chapters on roentgenographic pelvimetry and cephalometry. He discusses his own method of calculation, as well as the use of the Thoms' grid, and states various obstetric indications for use of roentgenologic studies. It would be quite surprising to learn that any reference to the pelvis in the world's literature has been overlooked, for there is appended to the text a bibliography of twenty-seven pages. Possibly the only criticism of such an outstanding collection of references might be that it was not classified into groups referable to the subdivisions of the text.

This book is such a splendid work of reference and of practical detail that it will be found of value to anyone teaching or practicing obstetrics.

PHILIP F. WILLIAMS.

RADIOLOGY AND RADIOTHERAPY

In the foreword of Lüttge's monograph on *Forceps Operation in Röntgen Picture*²⁶ Wintz outlines the advances in roentgenology, during the past fifteen years, and remarks upon its application to obstetrics; the diagnosis of pregnancy, pelvimetry, cephalometry, disproportion, birth mechanism and forceps delivery.

Lüttge in the text reviews the history and methods of obstetrical roentgenology. A broadening of the indications for forceps extraction, and the prerequisites, are described. He discusses mensuration of the pelvis, the effect of altered positions of symphysis upon the inlet and the relationship of the abnormal inlet upon the mechanism. In the chapter on the mechanics of forceps delivery he brings out the differences in the mechanics of birth when pressure is made from above and when traction is made from below, particularly in regard to the rotation of the head and the attitude of the child during the contractions of the uterus and traction on the forceps and the rotation of the various parts of the vertebral column. He shows the deviations in birth mechanism from normal in forceps deliveries, particularly with reference to the theory of Sellheim and the observations of Warnekros.

The indications and the limitations of forceps in hospital and home practice are outlined in table form.

Thirty-four roentgenograms portray clearly and accurately serial pictures of births, rotation of the head in spontaneous delivery and with forceps extraction. His conclusions seem amply substantiated on careful study and comparison of the serial pictures.

PHILIP F. WILLIAMS.

²⁶*Zangengeburt im Röntgenbild*. Von Dr. Werner Lüttge. Privatdozent für Geburtshilfe, Gynäkologie und Röntgenologie, Oberarzt an der Universitäts-Frauenklinik in Erlangen. Mit 7 Abbildungen und einem Atlas von 34 Kunstdrucktafeln. Ernst Reinhardt, München, 1933.

Simon's monograph on *Curie-Roentgen Therapy in Malignancies of the Female*²⁷ is the twentieth in the series of "Radiologische Praktika" which is edited by the outstanding radiologists and physicists in Germany and Austria. The title "Curie Therapie," in honor of the discoverer of radium, refers to all types of radium therapy rather than to the methods used at the Curie Institute in Paris. The volume was designed, as the author states in the introduction, for the use of those who have a practical working knowledge of gynecological radiology. He warns the novice of the dangers of radiation and emphasizes the fact that every patient with a malignancy is a law unto herself. For this reason he stresses the importance of special training in Radiology for those who intend to employ physical agents in the treatment of malignancies of the female genital tract.

The volume is divided into two parts. The first part deals with the biophysical factors underlying Radiation Therapy. The second half treats of the various malignancies of the vulva, vagina, cervix, fundus and ovaries. A brief review of the natural history and pathology of the different entities is given. The indications and contraindications and the results of radiation treatment are also discussed. In addition there is a brief review of various radiation methods that are used in the outstanding gynecological clinics on the continent.

The important rôle of Roentgen Therapy as an adjuvant to radium therapy is stressed throughout the volume. The methods that are used by the author resemble those generally employed in the best clinics both here and abroad. There are numerous illustrations of special applicators for radium therapy which the author has designed. The book is well printed and illustrated. It should be of value to anyone who wishes to have under one cover a résumé of the various methods used in gynecological radiation therapy.

WILLIAM HARRIS.

²⁷*Die Curie-Roentgentherapie bösartiger Frauenleiden.* By Dr. Stefan Simon. Georg Thieme, Leipzig, pp. 122, 1933.

(To be continued.)

Item

American Board of Obstetrics and Gynecology

The next written examination and review of case histories for certification by the American Board of Obstetrics and Gynecology will be held, according to location of applicants, in various cities of the United States and Canada, on Saturday, December 9, 1933, at 2 P.M. For application blanks and further details, address, Paul Titus, M.D., Secretary, 1015 Highland Building, Pittsburgh, Pennsylvania.